UNIVERSITY INSTRUCTIONAL MATERIALS CENTRE

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March 1972

SUMMARY

This study is concerned with the function of communication media in higher education, the increasing abundance of instructional aids, and their influence in teaching and learning systems.

It concerns the method used to meet today's educational needs and plan for tomorrow's, through the establishment of an "Instructional Materials Centre", which will facilitate the increased use of all media.

Part I formulates the educational philosophy of the I.M.C. and its role on the campus, as well as a description of its functions and special services.

Part II develops the building program which is the essential first step in the design of the I.M.C., and describes the projects and the teaching and learning systems that will be included in it.

Part III gives the architect inexperienced with this type of design more specific information about the influence of media on the design of an Instructional Materials Centre.

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PREFACE

This topic was selected for study because I believe that in the near future all universities will find it necessary to have their own "Instructional Materials Centre" to facilitate the use of modern technological aids to learning, as well as the more traditional library materials. These centres will also develop inter-university links for sharing of teaching facilities, pooling research information and holding colloquia.

Such a centre is a very special and expensive undertaking and it is imperative that its planning, especially the design, be entrusted to knowledgeable professionals.

The purpose of this study is to give the architect inexperienced with this unusual facility all the necessary information concerning the I.M.C. building program, which should be carefully considered and completely detailed.

This building program contains all the basic information concerning the educational philosophy of an I.M.C. It also provides all the guiding principles concerning the planning process of the I.M.C. and some examples of existing ones. Finally, it includes the architectural analysis of the I.M.C. resulting from the direct design influence of media.

This study does not include any concrete design proposals, for it does not apply to any specific project with specific limitations such as site, environment, number of students involved, budgeting, et cetera. Its aim is to provide all the information for the development of a prototype or ideal university I.M.C., which can be used in the future as an example for the design development of a specific project.

ACKNOWLEDGEMENTS

I am indebted to Rudoslav Zuk, Professor in the School of Architecture, for his guidance throughout my postgraduate studies at McGill University, and for his assistance during the preparation of my thesis, particularly the relationship matrices and the design.

My special thanks are due to Dr. Garry Coldevin, Professor in the Department of Education of Sir George Williams University, for the special attention given to me in his course in Instructional Communications, and the valuable advice he has provided throughout this study.

I am also grateful to Professor Leslie Doelle, visiting lecturer in Architectural Acoustics at the School of Architecture, and to Professor Rodolphe Lavergne, Associate Director of the Graduate School of Library Science, both of McGill University, for the information gained in their classes.

Thanks are also due to Heather Sommerville for her contributions during all phases of my work, in checking, correcting and making positive suggestions for improvement of the handscript of my thesis; to Miss Katerina Kalatzakis, who contributed to the preparation of the appendix and reviewed the final typescript; and finally, to Mrs. Joan Smith for her excellent typing work.

March 1972 Polydoros M. Zekkos

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The student of today, entering on a course of higher education at any college or university, is quite likely to find himself taught in a manner little different from that of his forerunners of twenty years ago. Traditional methods were evolved to cater to circumstances as they then existed, for example, the lecture may have seemed revolutionary when first introduced, but since then times have changed. The average student nowadays comes from a home background very different from the one common before the Second World War, the university or college he attends is much bigger, much more impersonal, and he will be taught in larger groups. But the most important factor is that today's student is a child of the age of media and messages. Thus if we want to increase the productivity of higher educction systems, we must learn to use all the instructional aids and media that the technologists can devise.

Since World War II, the development and use of instructive aids and media have been rapidly expanding, due in large part to the War itself. Films, film strips,

slides, and records were perfected and used extensively in training both civilian and military personnel. Since then, the opaque and overhead projector, as well as improved film projectors, have been developed; the 1950s brought the major development of television, and since then programmed instruction and electronic-based information retrieval and data-processing systems have come into wider use. These technical advances extended communication media so much that the medium became "the extension of the human senses".[1]

Media have also been used in increasing the efficiency and effectiveness of education. Books increased efficiency by making more information available to greater numbers of people at relatively low cost; blackboards made classroom instruction more effective, and the training methods developed during the War were geared to efficiency. The current high interest in media, supported by federal, provincial, foundation, and industrial programs, continues this trend by aiming chiefly towards increased efficiency and effectiveness of teaching.

A number of studies have been made investigating the feasibility of instruction by television and other new instructional devices. The results indicate that there is usually "no substantial difference" in learning achievement between the new methods and conventional methods. It should be noted, however, that these studies were conducted in converted, conventional, or often inadequate spaces. If favourable results can be obtained under such conditions, it is reasonable to expect decisive advantages with the use of instructional aids and media in spaces designed specifically for their optimum use.

Naturally the economic factor must be taken into account when the advantages and disadvantages of media use are considered. A careful cost analysis must be made for each situation to determine whether it is economically feasible. Factors such as equipment costs, faculty salaries, costs of facilities and maintenance, and course enrollments will vary with each situation; but by careful analysis a break-even point can be found between conventional instruction and a new approach using aids and media. However, general statements that "costs will be reduced

by using media" are not necessarily valid.

It is estimated that less than 1% of the total educational budget is spent on instructional aids and media, nevertheless they have had a considerable impact on education. Analysis of their potential value has led to redefinitions of educational goals, curriculum studies, course revisions, a review of the role of the library, and many other significant developments.

Through these new developments both professors and students now have available an array of equipment to help them achieve their learning objectives; for the creative and motivated professor this is both a challenge and an opportunity.

However, there are also problems facing the professor who wishes to use media instruction - complicated and costly equipment, poor maintenance, inadequate supply of parts and replacements, immobility of equipment, lack of technical assistance, and inadequate facilities. Many of these basic logistical problems must be solved one at a time, by the individual professor. Besides all these factors, there is the problem of finding the time to use

media well; in fact, it is surprising that media are in such wide use in view of these drawbacks.[2]

The use of media in instruction has always affected the design of educational buildings. The introduction of chalkboards requires appropriate viewing conditions and lighting; slides and films require that a screen be used, that a projector be positioned and powered, and that natural light be controlled by drapes or blinds.

With increased use, and the expanded range and sophistication of methods, the influence of instructional aids and media on the design of learning spaces is more extensive than ever before. In fact, their optimum utilization requires conscious planning efforts, a development of new concepts in educational facilities, and additional research, in order to determine the new meaning of the architectural spaces and their "hidden dimensions".[3] It is hoped that such a method of studying and planning of the learning spaces will prove both theoretically meaningful and applicable to current educational problems.

PART I

PRINCIPLES DISTINGUISHING AN I.M.C.

a) What is an I.M.C.

An educator's life is never dull and their lives have been filled of late with more than the usual number of explosions. The population explosion has filled their classrooms, and the explosion of knowledge has filled their waking hours. There has also been an explosive-like revolution in teaching methods and in the amount of material created for instructional purposes.

Aiding professors and students in dealing with the flood of knowledge, assisting them in using the wealth of instructional aids now available, and helping them to employ effectively the methods and "hardware" of the new teaching technology is the function of an "instructional materials centre". The concept of a unified service including both library and audio-visual materials is receiving rapid acceptance among educators. Whether it is called "materials centre", "curriculum laboratory", or "learning resources library", its purpose is to help create a richer learning environment through providing appropriate learning materials, experiences and resources.[4]

The instructional materials centre begins when traditionally regarded library and audio-visual departments are combined. From this union should come not only the sum of what previously was available in two separate areas of the university but also distinctly new services that result from the centralization itself. The concept of such a unified service is receiving rapid acceptance among educators.

b) Definition and Function of the I.M.C.

In materials centres all learning materials have equal status and receive consideration. The collection may contain the whole range of materials used in teaching. Printed matter such as books, pamphlets, periodicals - audio-visual material such as slides, film strips, films, records, recordings and equipment such as opaque and overhead projectors, film projectors, television, et cetera are equally available to professors and students. Free and inexpensive materials, charts, clippings, globes and maps are also included, as are the less common but useful items such as models, specimens, dioramas.

Ideas, too, are part of the centre. Bulletin board materials and suggestions, exhibit and display ideas, scripts, field trip and community resources files, and all manner of things which will make instruction more effective are housed in the centre. Professional books and periodicals as well as units of work and demonstration suggestions are also available.

The most important characteristic of an effective instructional materials centre is its skilled staff. A mature, experienced, and creative professional person who enjoys helping professors and students is the keystone of an effective program. Skill and knowledge in the total field of instructional materials are a necessity. Given adequate clerical help and funds, such a person can markedly influence teaching practices.

Current experiments in class size in independent student research, and in more effective utilization of professional staff members already are providing implications concerning changes in the use of instructional materials. More audio-visual materials undoubtedly will be used; departments will create many of their own instructional materials, and students will need additional guidance in finding information. Centralization of materials and services into a single department may be the answer. Facilities that are designed around such services - but still adaptable to future changes - will be necessary.[5]

Not only services and materials, but also instruction in the use of these materials should be provided by the instructional materials centre. Of course, economic advantages result from centralization, but better services and more effective utilization of materials already owned by the university are necessary.

The American Library Association in its new standards supports the centralization of all materials. Some universities are experimenting with materials centres for their students and faculties. Certain states, such as California and Florida, are showing major leadership in this direction.

c) How an I.M.C. is Used

Varied activities take place in a centre. Professors inquire about, order, preview or make the materials they need to do an effective teaching job. The materials specialist gives guidance in securing and using materials. Resource units and good ideas employed by other professors are shared. Students ask for data for research purposes or for a practical project, and they secure information about resource people. Administrators and curriculum people receive help in planning effective meetings and conferences or preparing booklets or reports. The centre collects many of the same kinds of publications as a curriculum laboratory and it performs some of the functions that educational documentation centres handle in other countries, servicing as a resource for professors, librarians, administrators and students.

Each student advances as fast as his ability and interest dictate. One may go through the curriculum of a traditional grade in four months, another will need fourteen. When he needs help he consults the professor; or he will be called into "studios".

At times a total class will come with a professor to learn about research tools or to use the centre's other resources. Often small or large groups will be at work in the studios finding information by examining printed or audio-visual materials. Materials and equipment also can be taken from the centre for classroom use.

In general two major types of activity go on in the centre: 1) reading, listening to, and viewing of materials by professors and students individually and in large or small groups; 2) professor and student preparation of teaching aids such as graphs, charts, slides, types, films, et cetera.

In the materials centre the specialist is concerned with acquiring, organizing, housing, and distributing the whole range of possible learning resources so as to enrich the learning environment of the university. Servicing and repair of materials and equipment are also the specialist's responsibility.[6]

d) The Advantages of the I.M.C.

In order to do the kind of teaching job expected by the community, a professor must utilize a wide variety of materials and approaches. Administrators and curriculum people can help professors by providing a climate which enables them to be creative and to bring to bear all possible resources for the solution of an instructional problem. It is in the classroom where the effect of the "explosions" is felt. Professors have always been busy people but now with the rapid increase in the numbers of students they must educate, an increasing emphasis on quality education, and the deluge of new knowledge and teaching materials, a comprehensive learning resources program is a necessity. It is more efficient and helpful for professors to have one place to go for teaching materials rather than to visit separate library and audio-visual departments. The unified collection encourages better and more frequent use of the learning materials available.

It is widely recognized that each learner has a pattern and rhythm of growth which are unique. Providing

the wide variety of learning experiences necessary to satisfy the different levels, abilities and interests is a challenge. A properly staffed and equipped materials centre can have real impact on the problem of differing learning rates. Easy access by professors and students to a wide variety of instructional materials and skilled guidance in the selection and use of these tools is necessary if we are to have the type of education required by today's demands.[7]

Certainly today there is no dearth of materials available commercially. But despite this embarrassment of audio-visual riches, many professors make little use of them. Why? Because they often aren't related specifically enough to the curriculum units they teach. Best answer, then, is to provide facilities for producing audio-visual aids on the spot to supplement those available commercially. They can be custom-made by the staff precisely to meet their own specifications - and sometimes as a cash savings over purchase or rental prices.

Locally-produced materials have several advantages over those on the market. First of all, they are

up-to-the-minute. There is normally a considerable lag between the time an event happens and the time it can be worked into an instructional aid and marketed. But if they have their own production facilities, professors can clip a map in today's newspaper or a picture on this week's Life, make an overhead transparency and project it in class immediately to show the latest invention, economic crisis, or political development.

Another advantage of locally-produced materials is the flexibility they allow the professor. Take the case of a closed-circuit class on physiology. The television instructor finds the right diagram of the human digestive system in a reference book, photographs it, and makes a large photographic print to project on the television screen. Then he has smaller duplicates made and circulates these along with the lesson outline to the professors who will be tuning into his lecture. Finally, he has 2" x 2" slides made up of the diagram for each professor to use in follow-up study.

Still another advantage with facilities for developing their own visual materials, professors can

practice "frontiersmanship" and try out new teaching methods - the "set theory" in mathematics, for example, or the use of visuals in language instruction.

"The value to the student of teaching aids tailored to the specific class is obvious enough. (Imagine the vo-ag student's heightened interest in the problem of soil erosion when he sees photographic samples taken right from his locality.) But values accrue to the professor as well. The very act of creating a teaching aid - whether bulletin board, display model, slide, or tape recording - helps the professor to evaluate the content of this presentation. (One university professor, highly respected in his academic specialty, revised six times a complex table he was to use in a visualized lecture before he felt it communicated precisely the point he wanted to get across.)"[8]

Too, the professors quickly learn how to evaluate the points in their messages, to decide which need to be nailed down with a visual image and which do not. As they use the media they come to know the advantages and limitations of each. And since they are using their own

talents and energies in developing their instructional aids, they can blame no one but themselves if their message is not communicated.

Obviously professors can no longer be expected to provide good instruction given only a blackboard, a few maps, and the loan of a filmstrip. They need ready access to the full range of instructional materials. Our advice to the educator who is intent on improving instruction is this: do not ignore the materials available commercially, but do not let go by default those that can be produced better right on the premises.

e) I.M.C. Services to Students[9] [10]

1) Organization of materials. The I.M.C. selects, orders, catalogues, and organizes all materials for use by student and professors. Anything aiding instruction is an instructional material and thus a service of the I.M.C. Pictures, models, maps, charts, and study kits must be numbered and filed in their designated areas; the professional resource file must list people in the community who can serve as resource speakers on given subjects and indexes places that are suitable for field trips. All materials must be listed in the card catalogue and distinguished by colour: a blue card may indicate films, yellow the study kits. Centres using this method would continue by adding colours for programmed lessons, models, and exhibits.

2) Circulation of materials. Circulation procedures resemble those of the traditional library, except that not only books and magazines may be checked out, but also audio-visual materials and programmed lessons, and even equipment for their use. Some audio-visual material can be booked in advance, as they are in audio-visual

centres, so that students and professors may know for what day and hour the materials are reserved for them.

3) Use of materials. The I.M.C. carrels or booths can be used by the student for reading purposes and for use of film or tape recordings. The student may also use one of the conference rooms which will provide electrical outlets and sound-proofing facilities. The film or filmstrip may be taken home, as books are in conventional libraries, and if the student does not happen to have a projector of his own he may obtain one at the I.M.C. and check it out for home use.

4) Guidance in finding materials. In the I.M.C. the librarian spends less time finding information for students, because they will learn their study skills early. Since students will spend sixty percent of their time in individual study, they must become proficient in finding what they need in the I.M.C.

5) I.M.C. instruction will be given in two ways. When several students are ready for advanced card catalogue experiences, their professor will direct them for small group instruction from the librarian or his assistant,

though the professor may do it himself. Or an individual student may ask to go to the I.M.C. for help from the librarian or through some self-instructional device: a study kit, programmed text, or teaching machine, on finding and using materials.

6) Reading guidance. Individual reading guidance will follow the pattern of the traditional class. There will be as much variety in the reading levels of students as in their mastery of content. Many students, however, will come to the I.M.C. to participate in discussions with others on the same reading level, or subject.[9] [10]

f) I.M.C. Services to Professors [9] [10]

In the conventional library the librarian assists a professor who must give one lesson to a class of thirty-five; in the I.M.C. the library personnel help a professor who is in charge of sixty students, but who has perhaps no more than six studying the same lesson at once.

1) Compiling bibliographies and assembling materials. The professor will be able to call on the I.M.C. when he has one student or a cluster of students who need material on a given subject. A list of all the books, films, and other materials on the subject will be compiled by the librarian and sent to the teacher. Often the materials themselves can be gathered when the professors request them. They may be placed on reserve for his students; or films, books, pictures, models, and exhibits are collected, checked out, and sent to the studios for the length of time they are needed, ranging from a day to a month. Because of the diversity of the collection, even bulletin board ideas and materials must be available to teachers. Book jackets, charts, pictures, letters, and

other objects must be checked out as often as are books in a conventional library.

2) Preparing teaching materials. If the library does not contain the materials needed by the professors, one of the I.M.C. personnel will help him make it, or may make it for him with the help of student assistants. Pictures can be enlarged on the opaque projector, transparencies can be made for overhead projection; models can be built; and collections of various types can be assembled. The I.M.C. must include a technical process department, with full-time persons in charge of graphics and production of teaching aids. All materials will be there: cardboard, construction paper, scissors, paper cutter, paints, all the table and counter space necessary.

3) Planning with professors. Planning takes up a large portion of time. Sometimes only a few minutes are needed to find a picture or map. More often the librarian or audio-visual specialist will visit a studio to discuss the materials needed by a group of students and their professor. In addition, monthly meetings must

be held with the various departments to discuss the needed materials. Often the librarian or audio-visual specialist will join the professor in previewing a film for prospective purchase.[9 10]

g) I.M.C. Facilities [11] [12]

There are four types of interrelated facilities that are required in a complete university instructional materials centre: 1) learning facilities, 2) production facilities, 3) communication facilities, 4) housing facilities. For truly effective utilization of instructional aids and media and in planning for new programmes, all four should be provided.

1) Learning facilities. The I.M.C. must be designed to provide facilities for large-group instruction, medium-sized classes, and small-group discussion, in which students come together with media, and usually with a professor for the purposes of instruction, learning and research, as well as to provide facilities for individual learning. These learning facilities may be of many types: seminar rooms, recitation rooms, learning laboratories, lecture rooms, classrooms, project rooms, case study rooms, et cetera. Each type may be necessary to the educational system, and in each the aids and media should be employed effectively.

2) Production facilities. Another strong influence on I.M.C. design is the increasing emphasis on local production of instructional material and programs, that is, those that are originated to meet the needs of particular learning situations. This has been accelerated by the demands of educational television as well as by the visual requirements of large-group instruction. Here also the teaching staff, as well as the individual student, receives assistance and support in the use of media. In those facilities professors and students are involved with the production of all types of graphic aids, including transparencies for overhead projection, 35 mm slides, motion pictures, black-and-white and colour photographs, models and apparatus, kinescopes and production sets for television and various video types.

3) Communication facilities. In these facilities, like the library, television and radio as part of and learning resources system, will have the opportunity to develop their potential to the fullest and to take on a new image. In no other single media-unit can we find as great a source of untapped dynamisms as in television and

radio. These facilities for the production of open-circuit and closed-circuit television programs, radio programs, video-tape services, et cetera must be highly sophisticated in design and all the electronic components for information transmission and display systems should be part of their structural design. The same electronic components must be repeated in all the learning facilities for group or independent study areas, in the learning laboratories of the centre, and in the science laboratories which can be housed in various science buildings of the university, as well as in the dormitory rooms, staff and graduate students' offices, and future facilities of the University, thus extending the possibilities for wide-angled learning systems of the centre, throughout the campus. The transmitting facilities for the broadcast services can of course be located several miles from the campus, on a hill or a tower.

4) Housing facilities. These facilities are the fourth essential component of an instructional materials centre, and they should provide adequate storage and

functional work space for the equipment. Here media in forms will be catalogued, stored and made readily accessible for individual learning and for group instruction. With the increasing use of instructional aids and media, and the loss of face-to-face contact, it becomes important to make the instructional materials used in class readily available to the students. Just as a student has a textbook, laboratory manual et cetera for initial instruction, review, study and supplementary learning, so the films, tapes, slides and other instructional materials should be available for similar functions. [11] [12]

h) The University I.M.C. and the Future

The following seven facts[13] indicate that the future must depend on the instructional materials centre. A child in Grade 1 this year will be about thirty years old in the year 2000 at the beginning of his most productive years. What kind of life will he be living? We need only take a look at the rapid changes taking place about us right now to hazard a guess:

1) Twenty percent of the jobs existing twenty years ago have become obsolete or are fast disappearing.

2) Thirty percent of the jobs existing today were unknown before the last war.

3) Ninety percent of the scientists of record are living today.

4) Three-thousand scientific journals alone are published every month.

5) Some types of skilled labour are moving into a four-day week.

6) Some kinds of information are building up so rapidly that electronic data processing is the only means of providing efficient retrieval.

7) Speedy communication of ideas is recognized as a key to world peace, understanding, and security.

This rapid change, due mainly to our technological progress, is so powerful that it changes our values and the relationships between people in families, friendships, sex, politics, as well as those between people and their dwellings, their business, et cetera.[14] The situation is similar, in education, and the problems which seem to be causing the most concern, besides the relationship between the university and the community, include student protest, the pressures of increased enrollment, the difficulty of finding adequate finances for higher education, a desire to make learning more individual, and the development of a system of continuing education relevant to the 1970s. These problems are interrelated, although in a complex way. However, techniques of educational technology are now being cooperatively used and can be increasingly used to help solve them, by setting up inter-university links[15] for the sharing of teaching facilities, pooling research information, holding colloquia, et cetera. The technical means are constantly

changing, as the national network of telecommunications is extended - that is, by the use of satellite communications for educational broadcasting stations, as new types of apparatus are developed and as prices respond to demand.

These facilities are mainly deployed to fulfil internal needs and expand intra-university activities in all the group and independent-study areas, laboratories, et cetera. The trend in the future must be towards extending their uses in inter-university cooperative projects and developing facilities for inter-university communication purposes, not only within one region or state, but throughout the whole country.

Finally, the conclusion is that the time is ripe to go on from considering the theoretical possibilities to setting up a series of experimental exchanges between universities on a variety of subjects and using a variety of techniques. The results of some experiments on inter-university communications in both North America and England, and the success of the "University of the Air" or "Open University"[16] providing for the home student an opportunity to proceed to a degree and using as its

main means correspondence tuition supplemented by the use of radio, telephone and television, gives us confidence, as a guide to the future of inter-university communication.

i) Footnotes

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PART II

HOW AN I.M.C. CAN BE ESTABLISHED

a) I.M.C. Planning Committee and the Role of the Architect

Planning an educational building is an especially difficult task, as is the design of an I.M.C. which will facilitate an increased use of media and yet meet the requirements for an up-to-date learning facility. It is obvious that "planning of an I.M.C. begins with an understanding of instructional communications and, through this understanding, a conviction that communication is a vital, necessary factor in teaching and learning."[1]

Thus the development of the building program is the essential first step in the design of the I.M.C., for which all those responsible for planning educational buildings and committing large amounts of money to their construction must jointly assume primary responsibility. The preparation of such a building program is a very complex process, for it involves many groups - university administrators, educators, library professionals, communications specialists, trustees, architects, planners, engineers and others - who do not speak the same language.[2] Their conflicting philosophies, policies and interests, as well as the complicated financial, political and

administrative factors make communication difficult. A truly successful educational system can result only when its programming has been thoroughly considered and completely detailed, and that requires hard work and diplomacy.

The formulation of the educational philosophy of the I.M.C., its behavioral objectives and its role on the campus and in the community as a whole, will follow the decision concerning the innovative projects that will be included in the building and the description of the functions to be served by it.

Besides this basic information, the building program should give the architect more specific information about the building he is to design, even more so when it concerns unusual facilities he has not had experience with.

This more specific information that should be provided to the architects is:

a) A schedule of all the required spaces of the building.

b) A definition of the number and the types of the users in each space.

c) The function of each space.

d) The size and shape of each space.

e) The necessary furniture and special equipment needed in each space.

f) The special considerations of each space such as: lighting, wiring, acoustic treatment, ventilation, heating, et cetera.

g) The access to and the location of each space.

h) A description of the desirable relationship between the required spaces.

i) The need of flexibility and expansion of each space.

A complete building program should include some other guiding principles in I.M.C. planning, such as:

a) The necessary personnel and their duties in planning activities and providing services.

b) The acceptable materials and equipment in quantity and quality to support the planned I.M.C.

c) The I.M.C. teaching and learning systems.

d) An annual budget sufficient to operate and develop the I.M.C.'s program.

e) Organization to provide for effective use of media by students and professors.

b) Changing Concepts in Library Building

The hypothesis of Mark Twain of the death of the book is greatly exaggerated. The book, which appears to have extraordinary survival power, has stood up against the threats of radio, film, and television. Since 1945, for example, when general television broadcasting began, the circulation of public library books in the United States has increased by more than 200 percent; and from 1960 through 1970 the numbers and titles of new books, and new editions of books produced in the United States, increased by more than 90 percent.[3]

But, library professionals as well as architects, college and university presidents, trustees, and all those responsible for planning library buildings and committing large funds to their construction, are acutely aware of the need for new solutions to mounting library problems. Major among these is the flood of new information. Most of the libraries are hard pressed for money to buy, and space to house, the books and journals. There are 400,000 books published annually worldwide, roughly twice that of a decade ago.[4] In the sciences

alone, where old-fashioned physics, biology, and chemistry have bred new fields like biomanagnetics, macromolecular physical chemistry, et cetera, there are 35,000 separate journals published annually with over 15 million articles in them. The journals themselves are estimated to be growing in number at the rate of 5 to 10 percent a year, the literature in them doubling every 10 to 15 years.[5] Cornell University catalogues over 85,000 titles a year. And if one considers that academic and research libraries tend to double the size of their collections every 16 to 20 years - then, in the words of mathematician, J. G. Kemeny, "the cost of building, of purchasing volumes, of cataloguing, and of servicing these gigantic libraries could eventually ruin our richest universities." This says nothing of the difficulties for the user as he approaches the huge card catalogues, or the reference librarian who is estimated at the present time to walk an average of eight miles a day on the job.

The 1965 report of the Office of Education, estimates that, in institutions of higher education, the indications are that more than 135 million new square

feet of space will be required by 1972. Librarians are the first to recognize that the solution is not simply more books, more buildings, and more librarians. What they look forward to and need, is a change in the very concept of what a library is: that is, beyond its function as a depository of books, the library must become a source of active information transfer. The new technologies offer the hope of realizing this concept, and librarians, above all, welcome it. Through computer storage and retrieval, microforms, long-distance transmission, and the like, it may yet be possible to multiply the usability of every information unit, to transcend the physical and geographic limitations of the library building, and perhaps, to make one's home or office, a place for learning as good as the best university library.

The questions that hang over the heads of library planners are a) the probability of these propositions, and b) whether they will be true for all types of information, in all types of libraries, in small ones as well as large, c) whether they will be economically practical or prohibitively expensive, and

d) the speed of change.

In June 1967, the Educational Facilities Laboratories, arranged in New York a symposium of librarians, communication and information technologists and architects. The topic was: "The Impact of Technology on Library Buildings."

The consensus of those who participated in the conference was that for at least the next 20 years the "book will remain an irreplaceable medium of information,"[6] and, therefore, library planners can proceed at this time with confidence that technological developments in the future will not change very much the way that the libraries are used. In planning library buildings today, planners should start with the library as the institution they now know it to be, but they must also be informed of the implications of the new technology, and provided with guidelines so they can proceed with confidence, knowing that the buildings they plan today will be usable in the future. The present state of library architecture, based on modular principles for interior flexibility,

has until now provided that confidence. We know that such buildings, appropriately located, planned for expansion, and with provisions for the addition of electrical and air-conditioning needs, can serve as well in 100 years as they do today.

Now, more than ever, it is important to design library buildings so they will be inviting and comfortable for people to use. The library building itself will gradually change, but people, who use libraries are a constant factor.

c) Relationship Between Library and I.M.C.

Questions about the relationship between the university library and the I.M.C. have periodically developed into deep concerns for both librarians and audio-visual specialists.

Librarians show a growing concern for "nonbook" materials. Many advocate the expansion of libraries to include not only books but pamphlets, films, pictures, records, models, et cetera, catalogued together for easy access, providing teachers and pupils a one-stop service. Some leaders advocate the library as the natural home for all types of independent study activities of pupils. This they would call an Instructional Materials Centre.

Many audio-visual instruction specialists see as part of their role a concern for "instructional" materials. In the past they have provided non-book types of teaching materials to classrooms, ranging from small film collections to centres including everything from real objects to abstract charts. Now many specialists include programmed learning materials and equipment among their service areas, thereby entering the area of

"linguistic-type" materials. These service organizations are also named Instructional Materials Centres.

This use of the I.M.C. label by members of both organizations together with the attendant broadening spheres of activities by professional members of each group raises important questions. Are the purposes of both groups alike? Do the services provided differ? An answer to this question was given by E. Heiliger, one of the most reputable librarians who wrote: "Librarians are eternally occupied with the need for more books, more space to put the books, and more staff to process the books. This seems to leave little time for an equally essential problem: how to make the books useful and meaningful to the users." Heiliger goes on to state that "a university library stands or falls on its contributions to the main task of the university - teaching students." He calls for a plan that would "integrate the library into a teaching program in a significant way." Heiliger recognizes that "one facet for this integration is a firsthand knowledge of each professor's work. With such a knowledge, the librarian could be forewarned of demands

to be made of services, could make the professor aware of additional library resources in course planning, and could gear its services to make the optimum contribution to the teaching situation."[7]

Here was an outstanding leader in the library movement calling for a reconstruction of the library's image and a redefinition of its role. But most colleges and universities continue to follow the traditional practice of separating audio-visual service from the library that contains printed materials. Many educators also have questioned this separation on theoretical grounds: Why should not the various media, materials, and services connected with their use be combined administratively for the greater convenience of instructors and students? As technological factors assume new importance in implementing communication processes generally, it would seem logical that coordination might be a means of reducing operating costs while improving the quality of the service. In view of such considerations, we are led to the conclusion that universities and colleges would do well to consider the case for an integrated organization

of learning resources, and to estimate the disadvantages of allowing new media centres and libraries to operate independently of each other. "For there are strong grounds for such an integration:

1) It overcomes immediately the print-media dichotomy.

2) It simplifies the access routes to teaching and learning resources for teachers and students, and facilitates the improved organization of the flow of information to faculty and students.

3) It provides the framework within which television (which almost invariably tends to run off operationally and cost-wise on its own) can be brought into a more balanced relationship with other media.

4) It provides an integrated production base for internal publications, teaching and learning materials, irrespective of the combinations of media required.

5) It helps turn the library into a much more dynamic agency, more integrally involved in institutional resource planning, and with the total process of teaching and learning.

6) It thus creates a university-wide, integrated resource system capable of combining flexible growth and administrative efficiency, also making possible economies of scale by centralization of appropriate manpower and technological plant."[8]

d) The I.M.C. Learning, Teaching and Communication Spaces

The previous chapters led us to the conclusion that the new complete I.M.C. must be designed to bring together the many modern technological aids to learning and the more traditional library materials, making them readily available in combined facilities for faculty and student use. As part of the Instructional Materials Centre, the library will be able to cope with the rapidly expanding body of knowledge, demanded by the space age and its new curriculum.

This total learning facility must be designed so that students and faculty would have ready access, in one place, to books, periodicals and other printed materials, various collections, pictures, reproductions, films, filmstrips, slides, records, tape recordings, television, cassettes, et cetera. All these materials must be listed in the main card catalogue file, so that individuals may readily locate all kinds of materials relevant to a given topic. In large university I.M.C.'s, the computerization of the card catalogue is necessary. The advantages of such an operation are: a) the accessi-

bility to users beyond the library, and b) the possibility of interchanging the catalogue information between university libraries.

The students and faculty should also have direct access to housekeeping areas which, in large university I.M.C.'s, should be computerized also, for better operation of the ordering and receiving departments, as well as for a more systematic circulation control.

Another area of a large university I.M.C. which will be completely computerized, perhaps within 10 years, is the storage and retrieval of widely-used, specialized technical data, which will gradually increase the production of microform texts.

A complete university I.M.C. should also contain the following facilities: a) learning laboratories, b) production laboratories, c) collections and display areas, d) learning and teaching spaces, e) science laboratories, and f) a communication centre.

a) The learning laboratories must contain: 1) curriculum laboratories, 2) tape language learning laboratories, 3) a library science audio-visual teaching

laboratory.

b) The production laboratories must contain: 1) instructional-materials production laboratories (charts, graphs, transparencies, models, apparatus, et cetera), 2) a dark room for slides and pictures and, 3) student do-it-yourself production laboratories.

c) It should also contain: 1) an art collection and display area, 2) a map and other printed materials collection and display cases, 3) rooms for special displays and demonstrations, and 4) a music collection.

d) The learning and teaching spaces may be of many types: 1) for large group instruction - auditorium, lecture rooms (the half rear projection rooms), class-rooms, assembly rooms, et cetera, 2) for small group discussion - seminar rooms, recitation rooms, conference rooms, music listening rooms, et cetera, 3) for independent study - case study rooms (with audition and preview facilities), case study areas (multi-media carrels), et cetera.

e) The science laboratories should be able to meet the needs of students and professors in physics,

chemistry, mathematics, biology, medicine, and engineering.

f) The Communication Centre must contain: 1) the television-department studios, conference rooms, dressing rooms, viewing gallery, offices, et cetera - for both open and closed-circuit programs, 2) the film department-studios, conference rooms, dressing rooms, rehearsal rooms, offices, et cetera - for super 8, 16 and 35 mm films, 3) the radio department-studios, collection room, offices, et cetera - for both cable and non-cable programs, 4) the distribution department, which will contain all the transmitting facilities for the broadcast services.

g) The Computer Centre will contain the central processing room, offices, a room for mechanized storage forms, as well as room for spare parts, testing equipment, and a general storage.

e) The I.M.C.: A Building or a System Centre?

It is understandable that all the learning, teaching and communication facilities that were listed in the previous chapter cannot be housed in a single architectural unit. Even the learning facilities have to be housed in more than one unit, if the Conventional University Library contains more than 100,000 volumes. (The McLennan Library of McGill University contains some 565,000 volumes.) Of course, all these distinct architectural units will function in symbiosis, to make up the Instructional Materials Centre of the University.

The first major sub-unit will contain: a) the Conventional University Library (ample land must be reserved for its expansion, as future requirements demand); b) the Information Storage and Retrieval Centre, and the housekeeping of all the programmed learning (non-print) materials and equipment (even if all these facilities were completely computerized, there would be no necessity to locate the central computer equipment within this building); and c) the Library Science Department.

The second major sub-unit will contain: a) the learning laboratories; b) the production laboratories; c) the collection and display areas; and d) the learning and teaching spaces.

These two major sub-units should be directly connected by an adjoining one, which will house all their common facilities, that is, staff areas, administrative areas, service areas, et cetera, so as to form the first architectural unit, which will evolve as a distinct facility type. Such a unit can then economically provide:

1) An efficient arrangement of the odd room shapes that are best for auditoriums, conference halls, lecture rooms, et cetera. There are many ways of doing this with a minimum of waste space.

2) Shared projection and listening areas, allowing expensive equipment to be brought together and used in one area. This insures proper care and adequate utilization of the equipment.

3) A real working combination, evolved by centralizing all teaching facilities and locating all production and learning spaces near them.

4) A central technical staff, working in one area rather than being scattered among many buildings.

5) A focal point for training faculty in effective use of all instructional aids and media.

6) The necessary special lighting and mechanical systems - special circuitry and air conditioning, for instance, are much more economical if centralized in one unit rather than dispersed in many.

The third major sub-unit will contain: a) all the Physical Science Laboratories (for physics, chemistry and mathematics); and b) all the Engineering Laboratories.

The fourth major sub-unit will contain: a) all the Biological Science Laboratories; and b) all the Medical Laboratories.

The last two major sub-units should also be directly connected, in the same way as the first two, so as to form the second architectural unit, which of course must be built as close as possible to the first one. This unit, too, will evolve as a distinct facility type, which will then economically provide:

1) Shared special services and facilities designed for large groups or for groups of varying sizes and equipped with special equipment.

2) Shared special classrooms, allowing expensive equipment to be brought together in one area for multi-media presentations.

3) Systematic analysis and evaluation of instructional functions, costs and results, for the purpose of improving the teaching effectiveness of this large number of laboratories.

4) A central technical staff which will include qualified "specialists" and "generalists", working in one area rather than being scattered among many buildings.

5) The necessary special technical and mechanical services such as lighting, air-conditioning, special circuitry, et cetera.

The establishment of such a unit applies only if it will be a part of the construction of a new university campus, or of new science, engineering and medical sub-units. In old university campuses, where these faculties are housed in different buildings and

often far from each other, all these laboratories will be scattered among them. If this is the case, these laboratories can still be, under special considerations, a part of the Instructional Materials Centre. In that case, of course, the economic advantages that were outlined in the previous paragraph, will not be applicable.

The third and last architectural unit of the University Instructional Materials Centre will consist of the Communication Centre, which will contain the television, film and radio departments (the distribution department can be located several miles from the campus, on a hill or in a tower), and the Computer Centre.

Of course, these two sub-units of the third architectural unit should be directly connected, in the same way as the previous ones, so that this unit, too, will evolve as a distinct facility type. Also, the whole unit should be built as close as possible to the other two, with which it will constitute the complete University Instructional Materials Centre.

This is a highly sophisticated unit and by placing its facilities together, it will then economically

provide:

1) Shared special facilities designed for special purposes and with special equipment such as recording studios.

2) Shared other facilities such as conference rooms, lecture rooms, dressing rooms, et cetera.

3) A real working combination, evolved by centralizing all studios and other special facilities and locating them near the facilities for broadcasting various types of programs.

4) A central technical staff, which will include "specialists", "generalists" and "engineers", working in one area rather than being scattered among many buildings.

5) The necessary very special technical and mechanical services such as acoustic control, air-conditioning, special circuitry, et cetera.

Again, the construction of such a unit applies only if it will be a part of the construction of a new university campus, or a part of the redevelopment of an old one; that is, if the Computer Centre has to be moved to larger and more convenient premises.

However, if the existing Computer Centre applies to the needs of the University, then the Communication Centre should, if possible, be built as an extension to it, in order to take advantage of the economic factors that were outlined in the previous paragraph.

If this is not possible, then the Communication Centre should be built very close to the first architectural unit, and be connected with it, in order to provide easy access to the studios for the professors and students working at the Production Laboratories of the first architectural unit.

There is no doubt that such an Instructional Materials Centre is an expensive undertaking; but for large universities which require such facilities, it can become their best long-term academic investment. The many factors that make this building special and expensive, make it imperative that its planning, and especially the design, be entrusted to knowledgeable professionals and not to uninformed persons.

f) University I.M.C.'s Teaching and Learning Systems and Special Equipment

The recognition of the need for individualized instruction in education, together with the technological developments in electronic and mechanical audio-visual devices, were, as explained in the introduction, the result of work done for military purposes. After the Second World War, their uses extended into other areas, and today the use of these audio-visual devices for educational purposes alone is rapidly growing into a billion dollar market.

Since statistical records for the non-theatrical film and audio-visual field came into use in 1956, the market has grown twice as fast as the nation's economy, showing an 83 percent growth.[9]

While the market continues to grow, it is also becoming more sophisticated and flexible, with new approaches and dimensions in this area reaching the education field every day. Thus, professors have to continue to make revolutionary changes in teaching systems with the new and sophisticated hardware and software that is now available.

It is absolutely necessary for the designer of the University Instructional Materials Centre to provide the conditions whereby evolution and revolution can take place in the teaching and learning systems.

The main systems, and the special equipment which is necessary in a new University I.M.C., are surveyed below.

A. Wireless teaching systems

The term "wireless" refers to systems in which the transmission of information is achieved without wire. However the equipment has to be plugged into standard electrical outlets or use batteries. These systems can be used in any space of approximately 10,000 square feet.

The programs can be broadcast from an ordinary tape recorder, or Audio Notebook (special tape recorder utilizing a tape with 22 master program tracks and one erasable recording track), and radio (AM, FM, RM transmission), and television, the professor's voice through a microphone, a "Time-Master", or a record player.[10]

These "closed-circuit radio network systems" are very useful for the teaching of languages, business

skills (stenography), et cetera, for they allow four or eight lessons to be broadcast simultaneously.

B. Learning (Language)laboratories

The language laboratory is defined as "a classroom or other area containing electronic and mechanical equipment designed and arranged to make foreign-language learning more effective than is usually possible without it."[11]

There are three systems of language laboratories: 1) the "class system", directed by a professor on a group basis; 2) the "self-instructional system", which is designed for students working independently and at their own convenience (dial access system); and 3) the "portable system" or "mobile language labs". The language laboratories are divided into three types:

1) Audio-passive type: the student listens to the recorded program on a disc or a tape through headphones (wireless teaching system).

2) Audio-active type: the student listens to the master recording, responds into an attached microphone, and instantly hears his own voice through the headphones.

3) Audio-active-comparative type: the student listens to the master recording, responds into the microphone, and then hears a recording of both the master voice and his own.

C. Telephone-based teaching systems

In these systems the "amplified telephone" and telephone lines are the main component. The main feature of the telephone teaching systems are: a) they are designed to reach larger numbers of students than would otherwise be possible, or those that are in another location far from the instructor; b) they can use both "life" and "recorded" instructional sources.

The main telephone-based teaching systems are the Blackboard-by-Wire and the Electrowriter.[12]

1) The Blackboard-by-Wire is a teaching system that transmits voice communications and handwriting over telephone lines at a relatively low cost. For example, a one-hour closed-circuit television transmission with one-way audio between two cities will cost four times as much as a similar transmission via the Blackboard-by-Wire system, which also allows two-way audio transmission.

While speaking from his classroom, office, or home, the professor illustrates his remarks with an electronic pen on the 8 x 6 inch writing surface of the system's transmitting console. The handwriting is transmitted over telephone lines to the television monitors at each reception point. A question indicator panel and a microphone at each reception point allow the students to ask questions and discuss ideas with the professor.

2) Similar to the "Blackboard-by-Wire" is a new device called the "Electrowriter", which also allows two-way audio transmission through telephone lines at a remarkably low cost.

It differs from the "Blackboard-by-Wire" system in that, on the Electrowriter, all handwritten notation, and mathematical formulae, drawings, et cetera, are enlarged to blackboard size or even larger, just as they are written, and are received on a large screen. With the amplified telephone, the students are able to discuss ideas with the professor.

D. Programmed instructors

These teaching machines are electronic devices capable of presenting programmed instruction materials, and can be housed together in one location for individual study. They are compact (they will fit on a small desk), light-weight, portable, and easy to store. There are five different types of programmed instructors:[13] 1) the linear programmed teaching system; 2) the Multiple Choice Programmed System; 3) the Card Source Audio-Visual Devices; 4) the Tachistoscopes Reading Devices; and 5) the Multi-Sensory Learning System.

1) The operation of the Linear Programmed Teaching System by the student is very simple. The first question frame is projected onto a small screen in front of the student. He writes his response on a strip of paper which is provided by the machine, and then presses the Answer button. The machine then uncovers the correct answer and the student compares his response with the correct one and presses the Advance button to present the next question. The programs may be purchased off the shelf, or they may be prepared locally by the faculty.

2) The Multiple Choice Programmed System is similar to the Linear Programmed Teaching System described above. In this system, a frame with a multiple-choice question is presented to the student. He selects an answer by pressing a button which corresponds to the letter of his answer on the frame. If the student has answered correctly, this button directs the machine to the next question frame. If he has answered incorrectly, frames containing information to help lead him to the correct response will be presented to him.

3) The Card Source Audio-Visual Devices System is not similar to the previous two systems, but its operation by the student is very simple. He takes a card, similar in size and shape to a computer punch card, and inserts it into the machine. The card contains a sound track, which the machine plays back over an individual headset, and a drawing or picture to illustrate the sound. The cards may be replayed by the student as many times as he wishes, and may be prepared locally by the faculty, using the machine to record sound tracks.

4) The Tachistoscope is a machine designed to increase a student's reading speed, by presenting words, letters, numbers and symbols to the student for brief periods - as little as 1/100 of a second with some devices. By gradually increasing the number of bits of presented information or by reducing the length of the presentation time, the reading speed is increased.

5) The Multi-Sensory Learning System (sometimes described as a talking typewriter) is a much larger and more sophisticated machine compared to the ones described above. The typing keys are colour-coded and lock in such a manner that only the correct key can be pressed by the student. This is a very effective system, for it serves as a reinforcement to the learning process. A page printer, and rear screen projector, and microphone, and a speaker are included in this system.

E. Television-based teaching systems

There are two types of television programs which are used as a teaching aid, the Instructional Television Programs (ITV), and the Educational Television Programs (ETV).

The Instructional Television Programs are generally planned for a particular teaching system, to fulfill a specific instructional purpose within a lesson; generally they originate through a closed-circuit system. These ITV programs might be prepared by a professor, a group of professors, a department, a group of departments within a university, or a group of departments from various universities.

The Educational Television programs are designed for general educative enrichment and might include both instructional programs and general educational information broadcasts. These ETV programs are usually open-circuit programs, but they may also originate within closed-circuit systems.

There are three systems[14] of transmitting television programs: 1) the open-circuit system; 2) the closed-circuit system, over the air; and 3) the closed-circuit system via coaxial cable.

1) Generally commercial and educational television stations broadcast over-the-air programs in an open-

circuit system. The signals are transmitted in all directions and can be received by regular domestic television sets; this is why it is referred to as an "open-circuit system." In the future, the transmission of television (and radio) programs via satellites will play a very important role in educational television, especially for those areas that are far from the major metropolitan centres.

2) The microwave transmission is referred to as a "closed-circuit system" because regular domestic television sets are not designed to pick up those types of signals, that is, those which are not transmitted in all directions, as with the open-circuit system, but from point to point. This system is used for several purposes, such as the linking of two or more transmitters at separate locations and possibly miles apart. This system also provides the rare opportunity in a television system for a two-way communication (talkback).

3) The "coaxial cable closed-circuit system" is used very often as a television link between buildings or groups of buildings which are not far apart. The

advantages of using this system rather than the microwave system are that it is more economical (if the buildings are not far away from each other) and the reception is more reliable, since the cable is not affected by atmospheric conditions. It is also possible to send television images by the "blackboard-by-wire" system, as described previously. There are basically three ways of displaying television programs, each of which may use any of the systems mentioned above. These are:

1) Individual viewing at a study carrel on a small television receiver (the individual study carrel will be described below).

2) Display to a classroom or lecture hall group (up to 30 students) on one television receiver, or for larger groups on more than one receiver.

3) Projection onto a large screen (front or rear) for group viewing, by means of a single television projector, which can be supplied from a television camera, television film chain (it includes more than one projector, that is, film, filmstrip, opaque, slides,

et cetera, attached to a television camera), or from a videotape recorder (an electro-mechanical machine which makes possible the recording and immediate playback of images and sound on magnetic tape).

F. Teaching Programs Through Radio Networks

Many broadcasting corporations are continuing to experiment in the production of programs designed specifically for a university audience. These programs are very much appreciated by both university professors and students, and there is a real, although still quite small, demand for exchange recordings of some of them.

The sound recording of lectures, informal talks, formal discussions, poetry readings, drama, et cetera on magnetic tapes, and the exchange of them among universities (not through radio medium), presents no difficulties, for there are many universities which at the present time have a large collection of sound recordings and records.

However, development in the radio medium calls for a greater assurance that the programs will actually be used by the larger university audiences for whom they

are designed, and, that there will be better "feed-back" from that audience than what has yet been achieved.

Perhaps the most successful experiment in providing university-level educational programs through the radio medium is that of the "University of the Air" (or "Open University")[15] in England. This new national academic institution, as mentioned above, is providing for the home student the opportunity to proceed to a degree by correspondence study, supplemented by the radio, telephone and television.

The transmission of these programs is usually provided by commercial or educational "over-the-air" broadcast stations (airplanes may also be used for this purpose), and in the near future transmission by satellite will also be possible. In effect, the transmission is provided by an "antenna", which can be used only for one-way broadcasting of audio programs.

Quite often also the "audio cable system" is used as a radio link between buildings or groups of buildings. The advantage of such a system is that it can be used for two-way broadcasting of audio programs.

G. Dial Access Information Retrieval Systems (DAIRS)

It has become necessary in the past few years for students to have individual study locations, and to have access from these locations to all sources of audio or visual information (such as slides, film-strips, films, audio tapes, records, tele-lectures, phonovid, electrowriter, microscope, commercial tele-vision, CCTV, videotape, et cetera). It was in response to this need that the dial access systems were adapted from their original use as language laboratories, to direct automatic access libraries of recorded as well as live programmed audio-visual information.

In dial access systems, the user location is usually an individual multi-media study carrel. The location of these carrels is not restricted to the Instructional Materials Centre; they may be located anywhere in the university campus (in seminar rooms and classrooms with dial outlet, in laboratory booths, in professors' or graduate students' offices, et cetera) or even off the university plant, in other universities, dormitories, or private homes.

The individual multi-media study carrel must be designed to accommodate not only all the necessary equipment for the dial-access system (described below), but also extra components such as writing surface, book-shelf, cabinet or locker, projector area, small screen, et cetera. The equipment necessary for the dial-access system is:[16]

1) A push-button selector for access to remote recorded programs.

2) An "intercom telephone" which enables the student to communicate with the operator at the control room or the professor at the console (live programs).

3) Headphones or small built-in speakers, for receiving any audio programs, and a microphone which enables the student to record these audio programs or his own voice if necessary. (The tape recorder itself is located in the control room and only the tape recorder controls are built into the carrel.)

4) A small television screen to receive the video components, and a separate cable which can carry the audio signals to the earphones or the speaker.

Because of the high cost of providing each student with his own study carrel, the ones that are to be located in general reading areas (that is, library, laboratories, et cetera), should be designed to permit double and even triple use of the space. In any case, the carrels must be movable, an important consideration in the flexible arrangement and use of reading spaces.

H. Computer-Controlled Teaching Systems

An educational computer system is a system that uses standard techniques of data processing to lead a student through a curriculum and to provide analysis of test and examination data, et cetera. These systems provide a rapid and very detailed analysis of a student's progress and can keep an up-to-date record of it, which will help the professor in his teaching decisions. Also in the independent study situation it will be possible for the computer to suggest the next phase of program study.

With these systems it is possible to overcome some current teaching problems. The first is the increasing size of classes and the resulting decrease in

contact between individual students and the professor; another is the minimized opportunity for two-way communication imposed by room-darkening during film lessons or by interrupting film or television presentations.

There are four types of computer-controlled teaching systems:[17]

1) The "Communicator System" is a classroom response system with push-button units located at each student position. The professor's desk is equipped with a panel of indicator lights, each of which represents a student station, with meters to register group responses, and with devices to count individual scores. (Fig. 1)

2) The "Multi-Media Control System" integrates the previous system with automatically-programmed audio-visual materials; it includes a two-track audiotape unit and controls for one or more filmstrips, slides, or 16 mm film projectors. Also a rear screen projection, overhead projectors, and television can also be integrated with the system.

3) The "Large Group Response System" which can serve up to four auditoriums with almost a thousand people

in each. To serve this number of students a "data acquisition and recording system" is integrated with the multi-media control system described above.

4) The "Multiple Answering Teaching Aid System" is a typical one that comes in both standard and mobile models. The latter is more popular because it can be used in any learning space, and it comes in three sizes - for 20, 30, and 40 students.

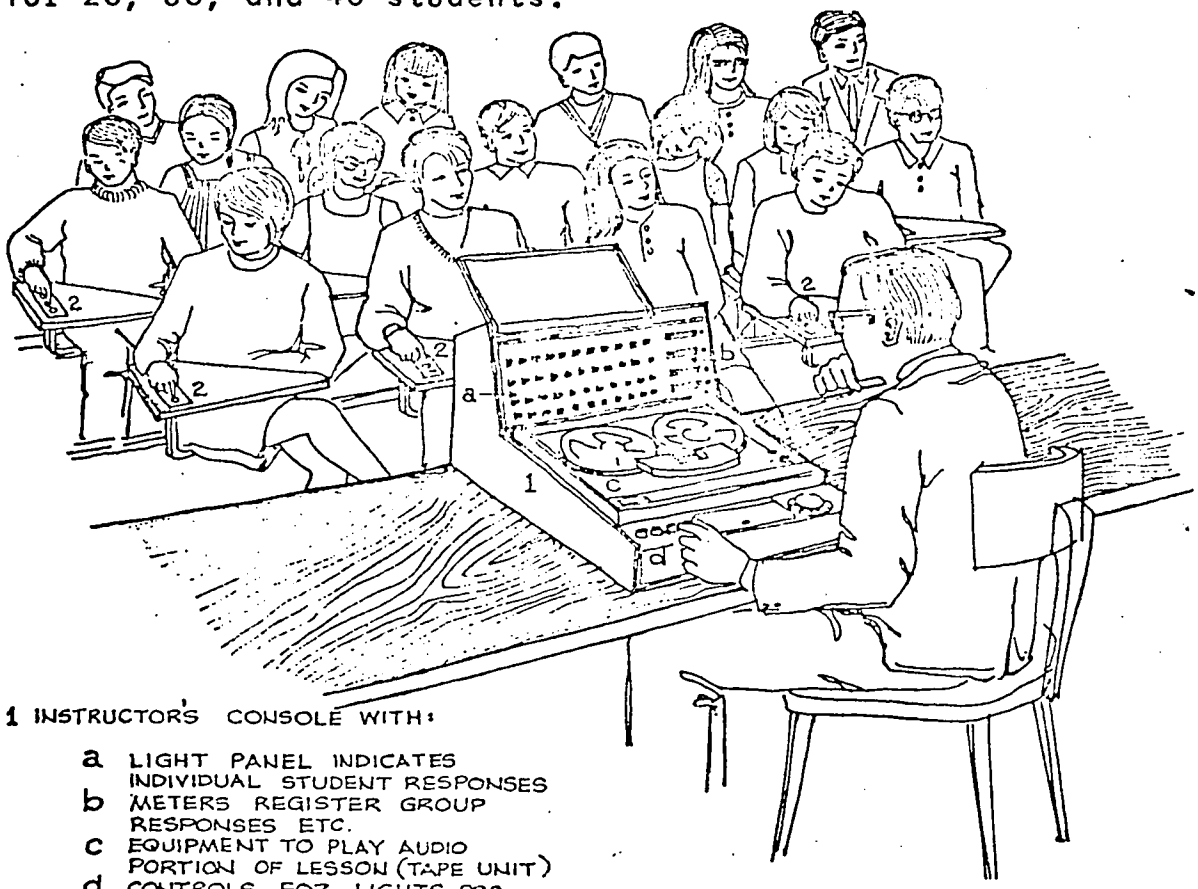


Fig. 1

I. Computer-Assisted Learning Systems

When the computer is used as the individual student's guide through a programmed course, this system is called "Computer-Assisted Learning System." There are several types of this system currently available, for example, the IBM, RCA, and GE, and each one uses a different computer language. There is a lack of actual written programs because the use of one computer language limits the use of that program to the specific computer system that it was designed for, and the translation of one program into another language is a very expensive and difficult process.

The location of the central equipment depends on the number of terminals and the complexity of the curriculum program. As an example, 1000 student terminals and tutorial programs of medium complexity require one control unit. The limitation in cable length is about 1000 feet from the control unit to the student terminal. This means that the I.M.C. will require more than one control unit if the student terminals are spaced far apart.

Each student terminal occupies approximately

10 - 25 square feet of floor space. These terminals can be arranged in many different groupings, such as a single terminal in a conventional classroom, clusters of carrels in flexible teaching spaces, or special terminal rooms.

The most sophisticated so far developed is the so-called "PLATO System," which is capable of controlling simultaneous programmed instruction for as many as 1512 students, and permitting each student to proceed with one of the 1510 programs at his own speed. The student terminal consists of:

1) A computer-controlled rear screen projector for filmstrips and a central slide selector (122 slides).

2) An instructional visual display device on which the central computer writes characters and draws diagrams.

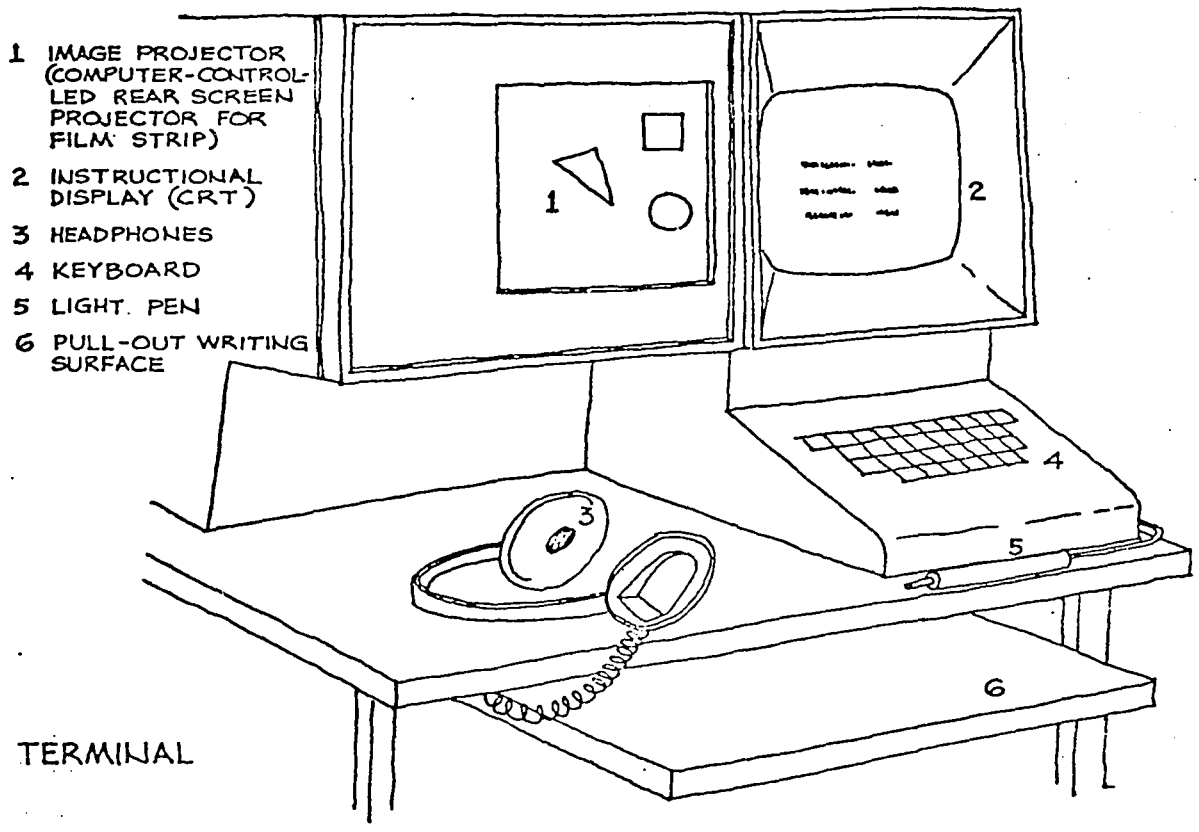
3) An electronic keyboard with which the student communicates with the central computer.

4) A light pen which provides faster student response to multiple-choice questions.

5) Earphones through which instructions are received.

6) A pull-out writing surface.

It should be noted that the student terminal is designed for use under normal classroom conditions, but the central computer area has special environmental needs (dust-free, stable temperature and humidity, special acoustic treatment). (Fig. 2)



Educational Facilities Laboratories

Fig. 2: PLATO single student terminal system.

g) I.M.C. Personnel

The new and growing interest in improving higher education through application of educational technology leads us directly to the need to train and educate professional educational personnel to carry out all the programs offered by the new university I.M.C.

Obviously, at the present time, it is very difficult to find people trained in all the aspects of the I.M.C.; but graduate programs can be established for the future training of these new educational personnel. Then the audio-visual people will be able to move into the presentation area as they learn about producing presentations, research design, et cetera, and the librarians will move into the individual study areas as they learn about newer media used in individual study, evaluation, guidance, programmed instruction, et cetera. All of them should be trained and experienced (at an audio-visual teaching laboratory), in the use of all types of materials and they should know how to teach the students to use these aids independently.

The necessary I.M.C. professional educational

staff consists of: 1) the I.M.C. director; 2) the director of the library and the information storage and retrieval department; 3) the director of the production and curriculum laboratories; 4) the director of the graphics and film departments; 5) the director of the television and radio departments; and 6) the technical director. (Fig. 3, 4)

1) The I.M.C. director will report directly to the dean of academic affairs, who together with his faculty will construct well-defined educational situations for the students. The responsibility of the I.M.C. director will then be to actualize these educational situations, "to provide leadership in design, implementation and evaluation of programs."[18] He will perform as a "generalist" or "middle man" between specialists like the librarians, audio-visual instructors, and the service organization, so he must understand both the traditional library procedures and the new technology and instruction.

2) The director of the library and the information storage and retrieval department will perform as a

specialist and will be responsible for the systematic collection and acquisition of information. He will supervise the classification, storage, and retrieval in all book and non-book forms. A head librarian, who will perform as an assistant director, will report directly to him. He will act as a coordinator between the other professional librarians (the serials, circulation, technical services, reference information retrieval services), notify the professors of additional library resources which may aid in course planning, and endeavour to make an optimum contribution to the teaching situation.

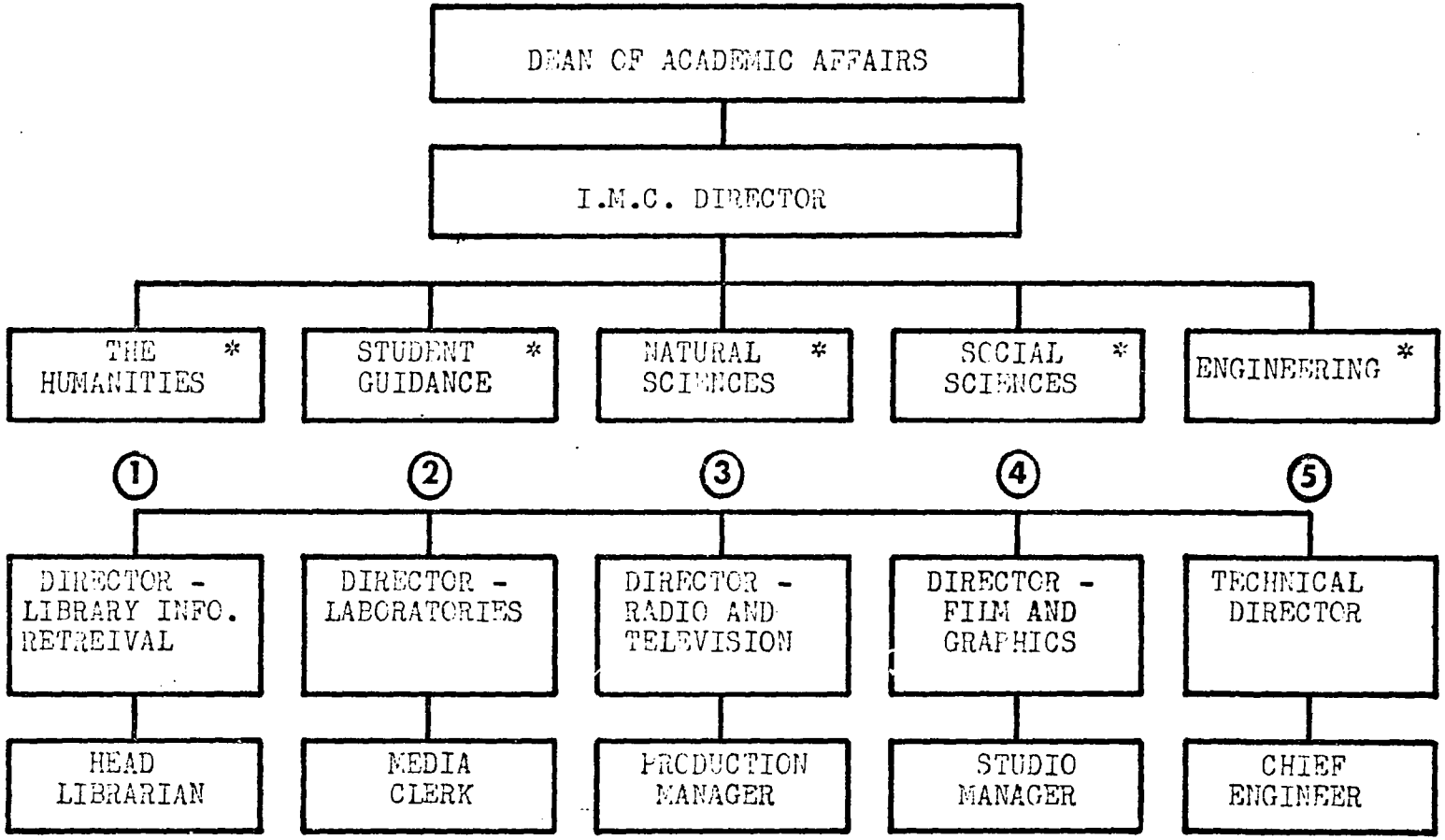
3) The director of the production and curriculum laboratories, as a specialist in audio-visual materials, will supervise the media experts and be responsible for coordinating the activities in the learning laboratories, providing guidance and assistance in the organization of the information, transmission, and display systems. As a specialist in programmed instruction, he will also supervise the media producers and will be responsible for producing programs, supervising research, and performing evaluation of courses.

4) The director of graphics and film departments will supervise all the artists, photographers, film producers, technicians, et cetera, and will be responsible for the production and reproduction of the graphic, photographic, film, and other forms of artistic visual presentation materials. He will provide guidance and assistance in the consultation, design and layout phases of production, for television, film and direct instruction.

5) The director of the television and radio departments, as a specialist, will supervise the television and radio program producers. He will then be responsible for production of broadcast and closed-circuit radio and television programs and video-tape services for direct or supplementary instructions.

6) The technical director or director of engineering will be responsible for the design, installation, maintenance, operation and expansion of all the electronic components of the I.M.C. facilities throughout the campus, and sometimes off-campus (dormitories, private houses, other universities, et cetera).[19]

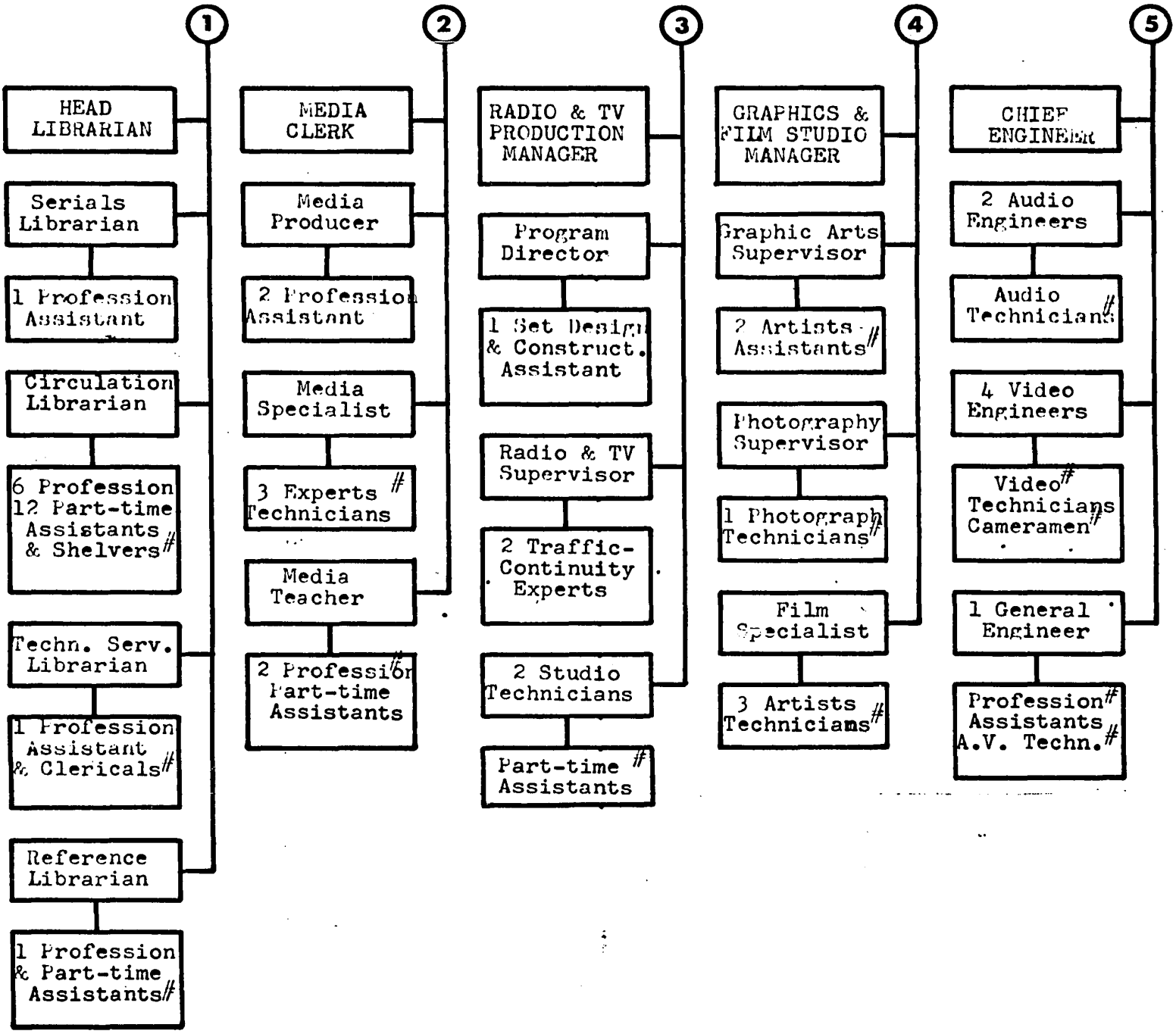
INSTRUCTIONAL MATERIALS CENTRE
LINE-STAFF ADMINISTRATION CHART



* Systems Designer (A subject-matter oriented communication media specialist)

INSTRUCTIONAL MATERIALS CENTRE

LINE-STAFF ORGANIZATION CHART



The number varies according to the size and the needs of each university I.M.C.

h) Some Examples of Existing University I.M.C.'s

It was mentioned in the first paragraph of Part I, that educational media programs in institutions of higher education are known by various names, and that they differ in the scope of their instructional services as well.

There are four main types of university educational centres: 1) the "Audio-Visual Centres," which handle only nonprint materials; 2) the "Learning Centres" or "Instructional Materials Centres" which combine both print and nonprint materials; 3) the "Research Centres" which place emphasis on research that relates to progress in instructional practices; and 4) the "Communication Centres," whose aim is the use of educational technology to link universities and exchange teaching between them.

Some examples of existing university educational centres are:[20]

1) Indiana University. The "Audio-Visual Centre" at Indiana University is a classic example of the educational media program, which handles only nonprint materials.

The present organization of the Audio-Visual Centre is concerned primarily with: a) off-campus rental circulation of motion pictures and other visual materials; b) on-campus audio-visual services to all departments and faculty members; c) production activities, including films, photographic and graphic materials and tape and disc recordings; d) on-campus closed-circuit television; and e) professional education that leads to a doctoral degree in audio-visual education.

2) San José State College. The "Audio-Visual Division" at San José State College also handles educational media services other than those related to printed materials. The responsibilities of this division may be described under the following categories: a) services dealing with utilization of materials and equipment; b) materials preparation services and production; c) on-campus technical services and maintenance; and d) on- and off-campus instructional television services.

3) Stephens College. The "Learning Centre" at Stephens College was established to bring together the many modern technological aids to learning and the

traditional library materials, and make them readily available in combined facilities for faculty and student use. The aims of this classic example of the second type of university educational centre are: a) to provide the modern educational materials resources and aids to learning; b) to create a favourable learning environment; c) to develop student capacity for self-education; d) to enable faculty and students to utilize their time and ability with greater effectiveness; and e) to provide instructional space and facilities designed for maximum utilization.

4) Florida Atlantic University. The "Learning Resources Division" at Florida Atlantic University was also established to make available to students all print and nonprint materials and aids to learning that will enable them to achieve maximum results with minimum faculty direction and supervision. "The main functions of the learning resources division are a) to put at the disposal of the teaching faculty all media, technology, services, and systems which will enhance the effective communication of ideas in the pre-programmed place of learning; b) to put at the disposal of the student all

media, technology, services, and systems which will enhance the effective communication of ideas in a self-programmed place of learning."[21]

5) The Pennsylvania State College. The "Division of Instructional Services" of the Pennsylvania State University is an example of a university educational centre with emphasis upon research. It was established to grow out of a complex of research activities with emphasis upon films, and later was transformed into an institutional research effort related to the instructional programs of the University and focussed upon the experimental development of closed-circuit television. Its contribution to the University's instructional programs are: a) instructional research and course development; b) examination services; c) instructional television; d) motion picture production; e) instructional graphics; and f) still-photography services.

6) The National Extension College, University of Cambridge, England. The "Inter-University Research Unit" of the National Extension College is an example of a university educational centre which places emphasis on

research into the possibility of using educational technology to link universities and exchange teaching between them. This research had its origins in the "Nine Universities Project" which carried out a systematic one-year investigation of the various ways in which modern techniques of telecommunication might help these universities, and others in England that had established central audio-visual units, "to pool their resources and thereby extend the range and broaden the scope of their teaching, and to facilitate exchanges between research workers by the cooperative use of educational technology."[22] In 1969 the Inter-University Research Unit came up with some important conclusions, the main one being that university-level education on open-circuit television will be universally available from 1971; and as a result of these conclusions, the idea of an "Open University" was then put into practice.

7) The State University of New York (SUNY). In the past few years the ten colleges of SUNY (in 1970 they had a total of 165,000 students) have undergone many changes. They established "Instructional Resources

Centres" in thirteen major campuses in an effort to change to multi-purpose institutions, by developing television links and exchanging teaching between universities. At the present time, because the idea of importing teaching material from another campus has not been as formidable as expected, there is some exchange between them, and some materials are imported from outside. These efforts enable students to follow courses which otherwise would not be available to them. The instructional resources centres feel that there is so much that can be done with the existing technology that they can afford to wait and install new facilities only when they feel there is an absolute need for it.

8) "La Commission Interuniversitaire." Ten years ago the Canadian French-speaking universities' extension departments formed this Commission, which acts as an inter-university link by administering a series of broadcasting television and radio courses, (cours télévisés et radio diffusés) with linked correspondence courses. Also the Commission coordinates the examinations which are organized by faculty members from all the member

universities. The main reasons for the creation of this Commission, besides the need for new forms of teaching in higher education, were the problem of exchanging materials between the campuses, because of the difficulty of communications in winter in Quebec, and because the C.B.C. felt that more air time should be made available for university-level teaching to a group of universities and not just to, say, the Université de Montréal.[23]

i) Footnotes

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PART III

ARCHITECTURAL ANALYSIS OF AN I.M.C.

a) Objective

This part of the study deals with the architectural analysis, resulting from the direct design influence of media on all those major sub-units of the university instructional materials centre that do not exist, or exist only on a small scale in few universities.

These major sub-units are: a) the conventional university library and the information storage and retrieval centre; b) the learning and production laboratories and the learning and teaching spaces (these two major sub-units, as mentioned previously, form the first architectural unit); and c) the communication centre and the graphic arts department.

The other major sub-units that this study does not deal with are common facilities that can be found in any university. These sub-units are: a) the physical science and engineering laboratories; b) the biological science and the medical laboratories; and c) the computer centre.

The purpose of this stage of the study is the development of specific design methods for the organization of main spaces according to the following design criteria: a) environment; b) location; c) growth; and d) technical.

b) Relationships Matrix of Main Spaces

The first design method is the Relationships Matrix which is a diagrammatic statement of all the main space relationships arising from the design criteria stated previously.

These main space relationships and the symbols with which they are characterized in the relationships matrix are:

1)	Essential relationship	△
2)	Desirable relationship	□
3)	Neutral relationship	○
4)	Desirably no relationship	■
5)	Absolutely no relationship	▲
6)	No relationship (Blank)	No symbol

SYMBOLS

ESSENTIAL	△
DESIRABLE	□
NEUTRAL	○
DESIRABLY NO	■
ABSOLUTELY NO	▲
NO RELATION	BLANK

RELATIONSHIPS MATRIX OF MAIN SPACES

UNIT I

ENVIRONMENTAL CRITERIA
1. Neutral Light
2. View - Out
3. View - In
4. Quiet Surrounding

LOCATION CRITERIA
1. Main Floor Location
2. Underground Location
3. Overground Location
4. Access to Main Circulation
5. Access to Secondary Circul'n.
6. Access to Vertical Circul'n.
7. Close to Main Entrance
8. Close to Delivery Entrance
9. Close to Emergency Exit

GROWTH CRITERIA
1. Internal Flexibility
2. Internal Adaptability
3. External Expansion

TECHNICAL CRITERIA
1. Special Acoustic Treatment
2. Special Fire Resist.
3. Special Lighting System
4. Special Circuitry System
5. Special Air-Conditioning Syst.
6. Special Treatment for Handicapped

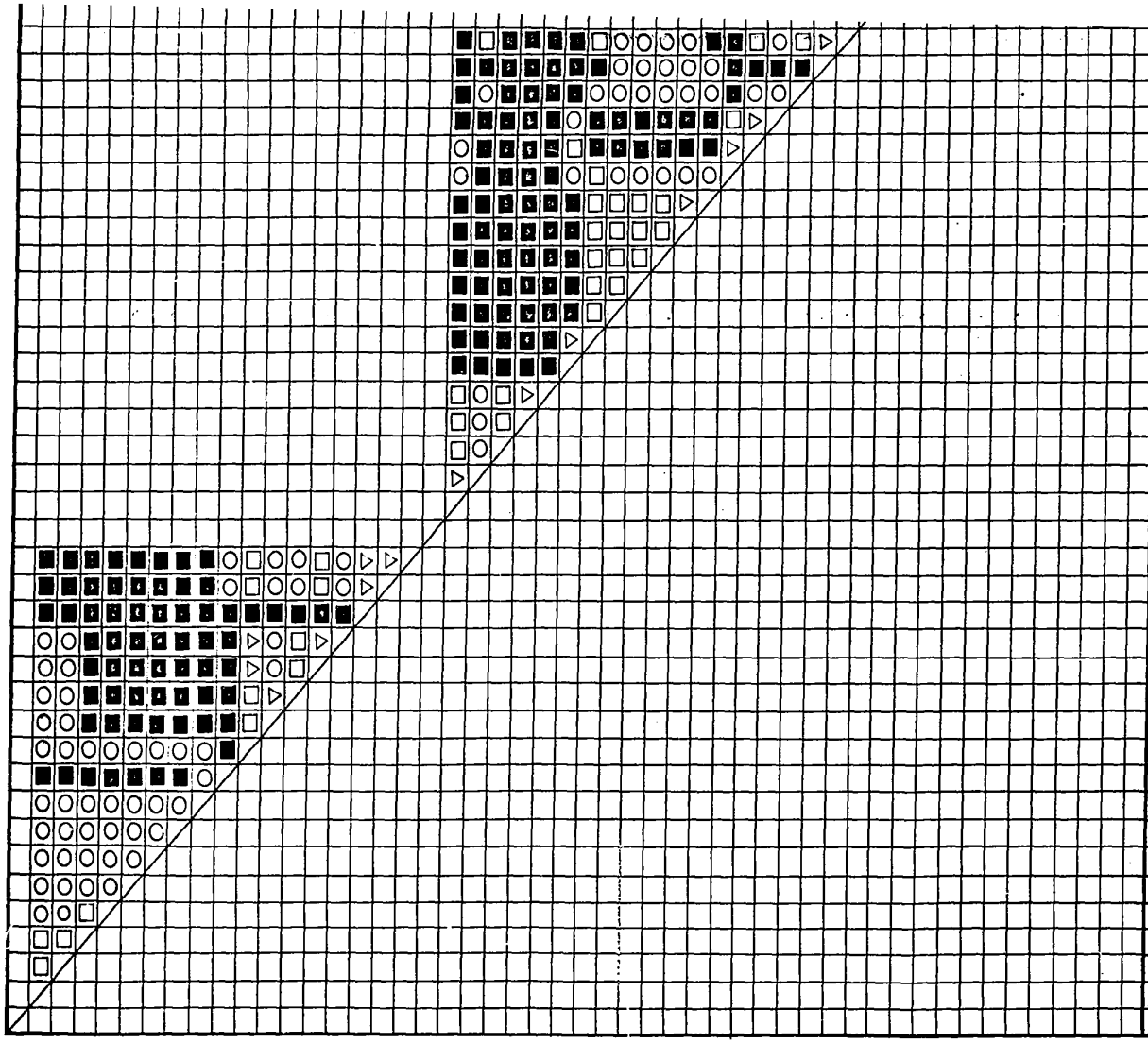
COMMON SPACES OF UNITS A'-B'
1. Main Lobby
2. Circulation Department
3. Administrative Area
4. Staff Working Area
5. Faculty Area
6. General Service Area
7. Cloak Room
8. Lounge
9. Staff Accomodations
10. Mechanical & Electrical Servic
11. General Storage Area

UNIT A': MAIN SPACES
1. Catalogue & Info. Storage Dept.
2. Reference Department
3. Technical Services Department
4. Music Collection Department
5. A-V Shelving Area
6. A-V Reading Area
7. Periodicals Department
8. Microfilm Department
9. Microfilm Collection Dept.
10. Government Documents Dept.
11. Archives Department
12. Book Stacks
13. Library Reading Area
14. Library Science-Administratio
15. Library Science Lecture Room
16. Library Science Classroom
17. Library Science Library-Stack
18. Lib. Science Libr. Reading Are

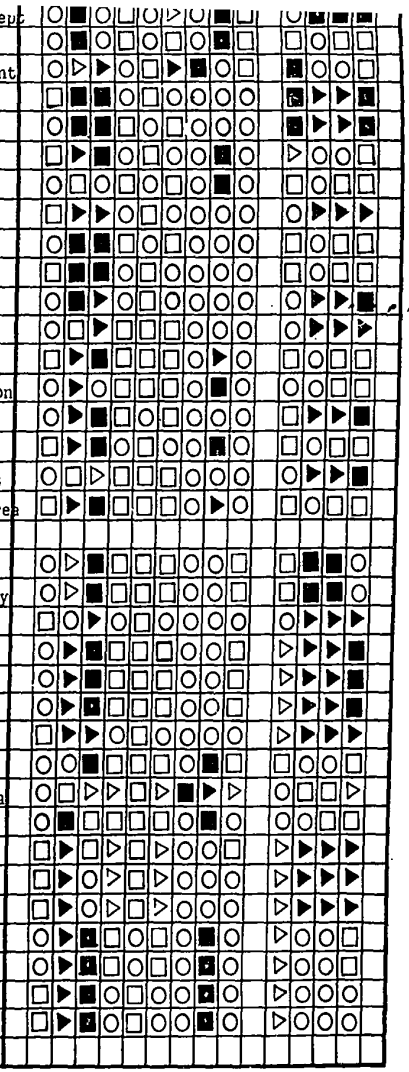
COMMON SPACES OF SUB-UNITS A-B
1. Main Lobby
2. Circulation Department
3. Administrative Area
4. Staff Working Area
5. Faculty Area
6. General Service Area
7. Cloak Room
8. Lounge
9. Staff Accomodations
10. Mechanical & Electrical Servic
11. General Storage Area

SUB-UNIT A: MAIN SPACES
1. Catalogue & Information Storag
2. Reference Department
3. Technical Services Dept.
4. Music Collection Department
5. A-V Shelving Area
6. A-V Reading Area
7. Periodicals Department
8. Microfilm Department
9. Microfilm Collection Dept.
10. Government Documents Dept.
11. Archives Department
12. Book Stacks
13. Library Reading Area
14. Library Science-Administratio
15. Library Science Lecture Room
16. Library Science Classroom
17. Library Science Library-Stack
18. Lib. Science Libr. Reading Are

SUB-UNIT B: MAIN SPACES
1. I.M. Production Laboratory
2. Student Production Laboratory
3. Dark Room
4. Curriculum Laboratory
5. A-V Teaching Laboratory
6. Language Laboratory
7. Recitation Room
8. Special Display & Demonstr. Rm
9. Art Collection & Display Area
10. Assembly Room
11. Auditorium (500-600)
12. Lecture Room (200-250)
13. Lecture Room (120-150)
14. Classroom (60-80)
15. Classroom (45)
16. Conference Room (10-20)
17. Seminar Room (10-15)



1	Catalogue & Info. Storage Dept
2	Reference Department
3	Technical Services Department
4	Music Collection Department
5	A-V Shelving Area
6	A-V Reading Room
7	Periodicals Department
8	Microfilm Department
9	Microfilm Collection Dept.
10	Government Documents Dept.
11	Archives Dept.
12	Book Stacks
13	Library Reading Area
14	Lib. Science - Administration
15	Lib. Science - Lecture Room
16	Library Science Classroom
17	Lib.Science Library - Stacks
18	Lib.Science Libr.-Reading Area
	UNIT B': MAIN SPACES
1	I.M. Production Laboratory
2	Student Production Laboratory
3	Dark Room
4	Curriculum Laboratory
5	A-V Teaching Laboratory
6	Language Laboratory
7	Recitation Room
8	Special Display & Demo. Room
9	Art Collection & Display Area
10	Assembly Room
11	Auditorium (500-600)
12	Lecture Room (250)
13	Lecture Room (120-150)
14	Classroom (60-90)
15	Classroom (45)
16	Conference Room (10-20)
17	Seminar Room (10-15)



SYMBOLS

ESSENTIAL	△
DESIRABLE	□
NEUTRAL	○
DESIRABLY NO	■
ABSOLUTELY NO	▲
NO RELATION	BLANK

RELATIONSHIPS MATRIX OF MAIN SPACES

UNIT I

ENVIRONMENTAL CRITERIA
1. Neutral Light
2. View - Out
3. View - In
4. Quiet Surrounding

LOCATION CRITERIA
1. Main Floor Location
2. Underground Location
3. Overground Location
4. Access to Main Circulation
5. Access to Secondary Circul'n.
6. Access to Vertical Circul'n.
7. Close to Main Entrance
8. Close to Delivery Entrance
9. Close to Emergency Exit

GROWTH CRITERIA
1. Internal Flexibility
2. Internal Adaptability
3. External Expansion

SPECIAL CRITERIA
1. Special Acoustic Treatment
2. Special Fire Barrier
3. Special Lighting System
4. Special Circuitry System
5. Special Air-Conditioning Syst.
6. Special Treatment for Handicapped

COMMON SPACES OF SUB-UNITS A-B
1. Main Lobby
2. Circulation Department
3. Administrative Area
4. Staff Working Area
5. Faculty Area
6. General Service Area
7. Cloak Room
8. Lounge
9. Staff Accomodations
10. Mechanical & Electrical Servic
11. General Storage Area

SUB-UNIT A: MAIN SPACES
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17. Seminar Room (10-15)

COMMON SPACES OF UNITS A-B
1. Main Lobby
2. Circulation Department
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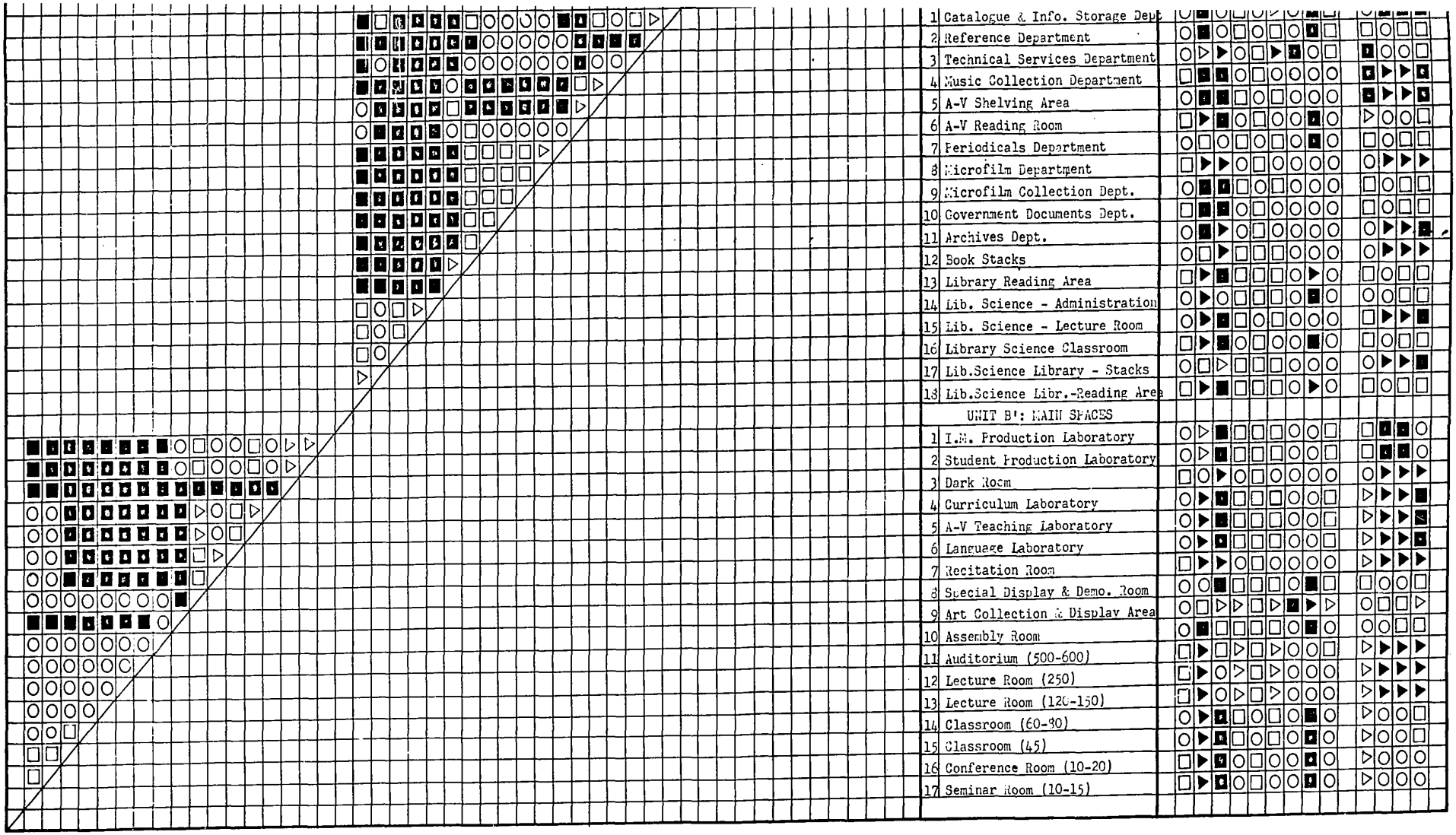
4. Music Collection Department
5. A-V Shelving Area
6. A-V Reading Area



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6	A-V Reading Room
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9	Microfilm Collection Dept.
10	Government Documents Dept.
11	Archives Dept.
12	Book Stacks
13	Library Reading Area
14	Lib. Science - Administration
15	Lib. Science - Lecture Room
16	Library Science Classroom
17	Lib.Science Library - Stacks
18	Lib.Science Libr.-Reading Area

UNIT B': MAIN SPACES

1	I.M. Production Laboratory
2	Student Production Laboratory
3	Dark Room
4	Curriculum Laboratory
5	A-V Teaching Laboratory
6	Language Laboratory
7	Recitation Room
8	Special Display & Demo. Room
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11	Auditorium (500-600)
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13	Lecture Room (120-150)
14	Classroom (60-80)
15	Classroom (45)
16	Conference Room (10-20)
17	Seminar Room (10-15)

SYMBOLS

ESSENTIAL △

DESIRABLE □

NEUTRAL ○

DESIRABLY NO ■

ABSOLUTELY NO ▲

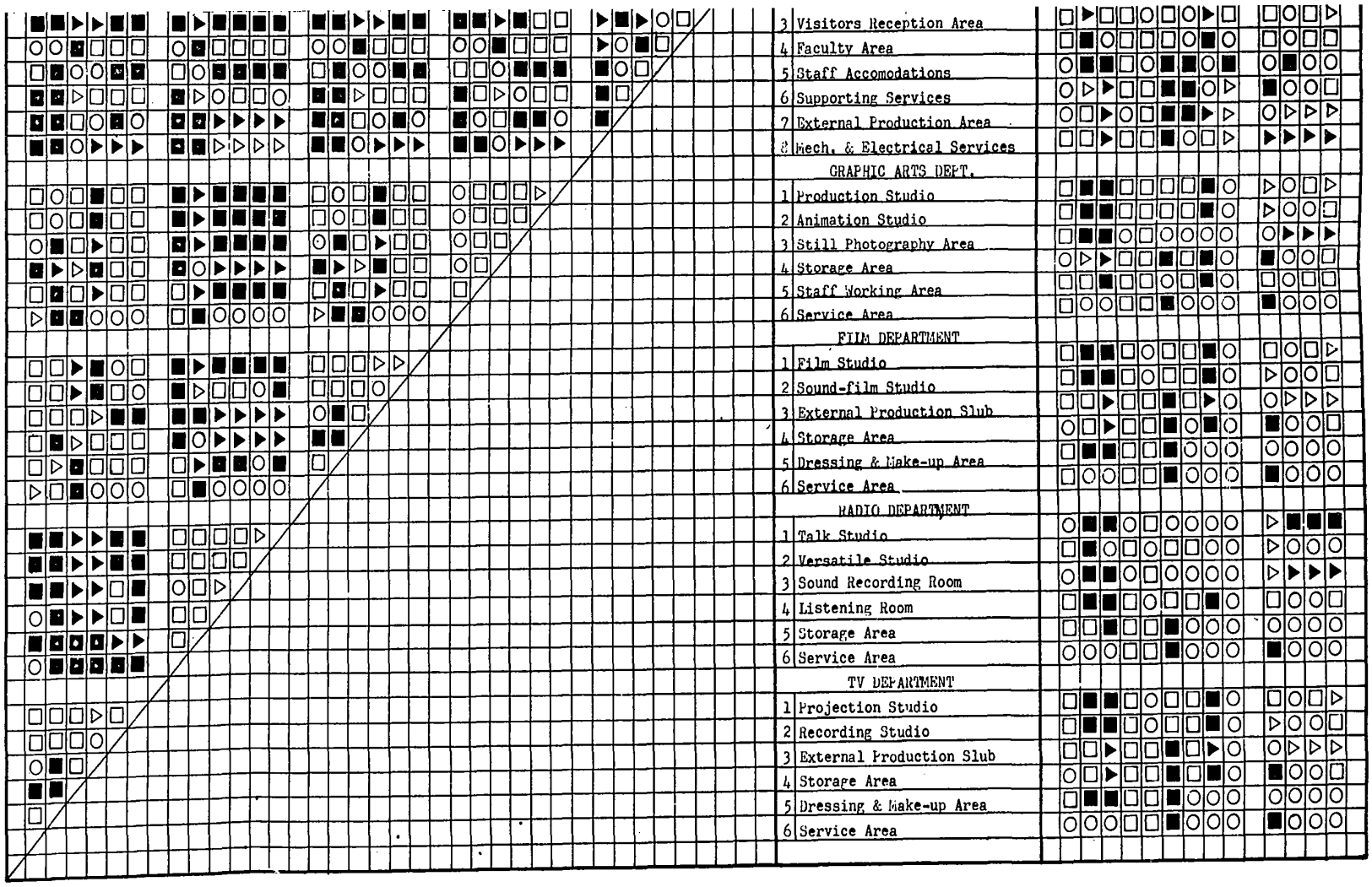
RELATIONSHIPS MATRIX OF MAIN SPACES

SUB-UNIT V

	GROWTH CRITERIA	1 Internal Flexibility	2 Internal Adaptability	3 External Expansion	TECHNICAL CRITERIA	1 Special Acoustic Treatment	2 Special Fire Rating	3 Special Lighting System	4 Special Circuitry System	5 Special Air Cond. System	6 Special Treatment for Handicapped
ENVIRONMENTAL CRITERIA											
1	Natural Light	△	□	△		○	□	□	⊡	○	△
2	View - Out	□	○	□		○	□	○	○	○	○
3	View - In	□	□	○		□	□	□	□	○	□
4	Quiet Surrounding	○	○	○		□	□	○	○	○	□
LOCATION CRITERIA											
1	Main Floor Location	■	■	○		■	□	○	○	■	○
2	Underground Location	□	□	□		■	△	□	■	■	□
3	Overground Location	▲	○	□		▲	○	□	■	■	□
4	Access to Main Circulation	▲	○	□		▲	△	□	■	■	□
5	Access to Secondary Circul'n.	▲	○	□		▲	△	□	■	■	□
6	Access to Vertical Circul'n.	▲	○	□		▲	△	□	■	■	□
7	Close to Main Entrance	▲	○	□		▲	△	□	■	■	□
8	Close to Delivery Entrance	▲	○	□		▲	△	□	■	■	□
9	Close to Emergency Exit	▲	○	□		▲	△	□	■	■	□

	COMMON SPACES	1 Main Lobby	2 Administrative Area	3 Visitors Reception Area	4 Faculty Area	5 Staff Accomodations	6 Supporting Services	7 External Production Area	8 Mech. & Electrical Services
COMMON SPACES									
1	Main Lobby								
2	Administrative Area	□							
3	Visitors Reception Area	△	△						
4	Faculty Area	□	□	□					
5	Staff Accomodations	○	○	○	□				
6	Supporting Services	▲	■	▲	■	□			
7	External Production Area	■	■	■	○	○	□		
8	Mechan. & Electr. Services	▲	▲	▲	▲	■	■	■	
GRAPHIC ARTS DEPT.									
1	Production Studio	■	○	□	□	■	□	○	▲
2	Animation Studio	■	○	□	□	■	□	■	▲
3	Still Photography Area	■	■	■	□	■	○	■	▲
4	Storage Area	▲	▲	▲	■	○	△	□	○
5	Staff Working Area	■	■	■	○	□	□	○	■
6	Service Area	■	■	■	○	□	■	■	■
FILM DEPARTMENT									
1	Film Studio	■	○	■	□	■	□	○	▲
2	Sound-film Studio	■	○	■	□	■	□	■	▲
3	External Production Slub	■	■	▲	□	○	□	○	▲
4	Storage Area	▲	▲	▲	■	○	△	□	○
5	Dressing & Make-up Area	■	■	■	○	■	■	■	■
6	Service Area	■	■	■	○	□	■	■	■
RADIO DEPARTMENT									
1	Talk Studio	■	○	■	□	■	○	▲	△
2	Versatile Studio	■	○	■	□	■	□	▲	△
3	Sound Recording Room	■	○	■	□	■	□	▲	△
4	Listening Room	■	○	■	□	■	○	▲	△
5	Storage Area	▲	▲	▲	■	○	△	■	■
6	Service Area	■	■	■	○	□	■	■	■
TV DEPARTMENT									
1	Projection Studio	■	○	■	□	■	□	○	▲
2	Recording Studio	■	○	■	□	■	□	■	▲
3	External Production Slub	■	■	▲	□	○	□	○	▲
4	Storage Area	▲	▲	▲	■	○	△	□	○
5	Dressing & Make-up Area	■	■	■	○	■	■	■	■
6	Service Area	■	■	■	○	□	■	■	■

	GRAPHIC ARTS DEPT.	1 Production Studio	2 Animation Studio	3 Still Photography Area	4 Storage Area	5 Staff Working Area	6 Service Area
1	Production Studio	△					
2	Animation Studio	□	□				
3	Still Photography Area	□	□	□			
4	Storage Area	□	□	□	□		
5	Staff Working Area	□	□	□	□	□	
6	Service Area	○	○	○	○	□	
FILM DEPARTMENT							
1	Film Studio	□	□	□	□	□	□
2	Sound-film Studio	□	□	□	□	□	□
3	External Production Slub	■	■	▲	■	▲	▲
4	Storage Area	□	□	□	△	□	□
5	Dressing & Make-up Area	○	○	■	▲	■	■
6	Service Area	□	□	⊙	■	□	□
RADIO DEPARTMENT							
1	Talk Studio	■	■	■	▲	■	■
2	Versatile Studio	■	■	■	▲	■	■
3	Sound Recording Room	■	■	■	▲	■	■
4	Listening Room	■	■	■	▲	■	■
5	Storage Area	▲	▲	▲	○	▲	▲
6	Service Area	■	■	■	■	■	□
TV DEPARTMENT							
1	Projection Studio	□	□	□	□	□	□
2	Recording Studio	□	□	□	□	□	□
3	External Production Slub	■	■	▲	■	▲	▲
4	Storage Area	□	□	□	△	□	□
5	Dressing & Make-up Area	○	○	■	▲	■	■
6	Service Area	□	□	○	■	□	□



3	Visitors Reception Area
4	Faculty Area
5	Staff Accomodations
6	Supporting Services
7	External Production Area
8	Mech. & Electrical Services

GRAPHIC ARTS DEPT.

1	Production Studio
2	Animation Studio
3	Still Photography Area
4	Storage Area
5	Staff Working Area
6	Service Area

FILM DEPARTMENT

1	Film Studio
2	Sound-film Studio
3	External Production Slub
4	Storage Area
5	Dressing & Make-up Area
6	Service Area

RADIO DEPARTMENT

1	Talk Studio
2	Versatile Studio
3	Sound Recording Room
4	Listening Room
5	Storage Area
6	Service Area

TV DEPARTMENT

1	Projection Studio
2	Recording Studio
3	External Production Slub
4	Storage Area
5	Dressing & Make-up Area
6	Service Area

SYMBOLS

ESSENTIAL △

DESIRABLE □

NEUTRAL ○

DESIRABLY NO ■

ABSOLUTELY NO ▲

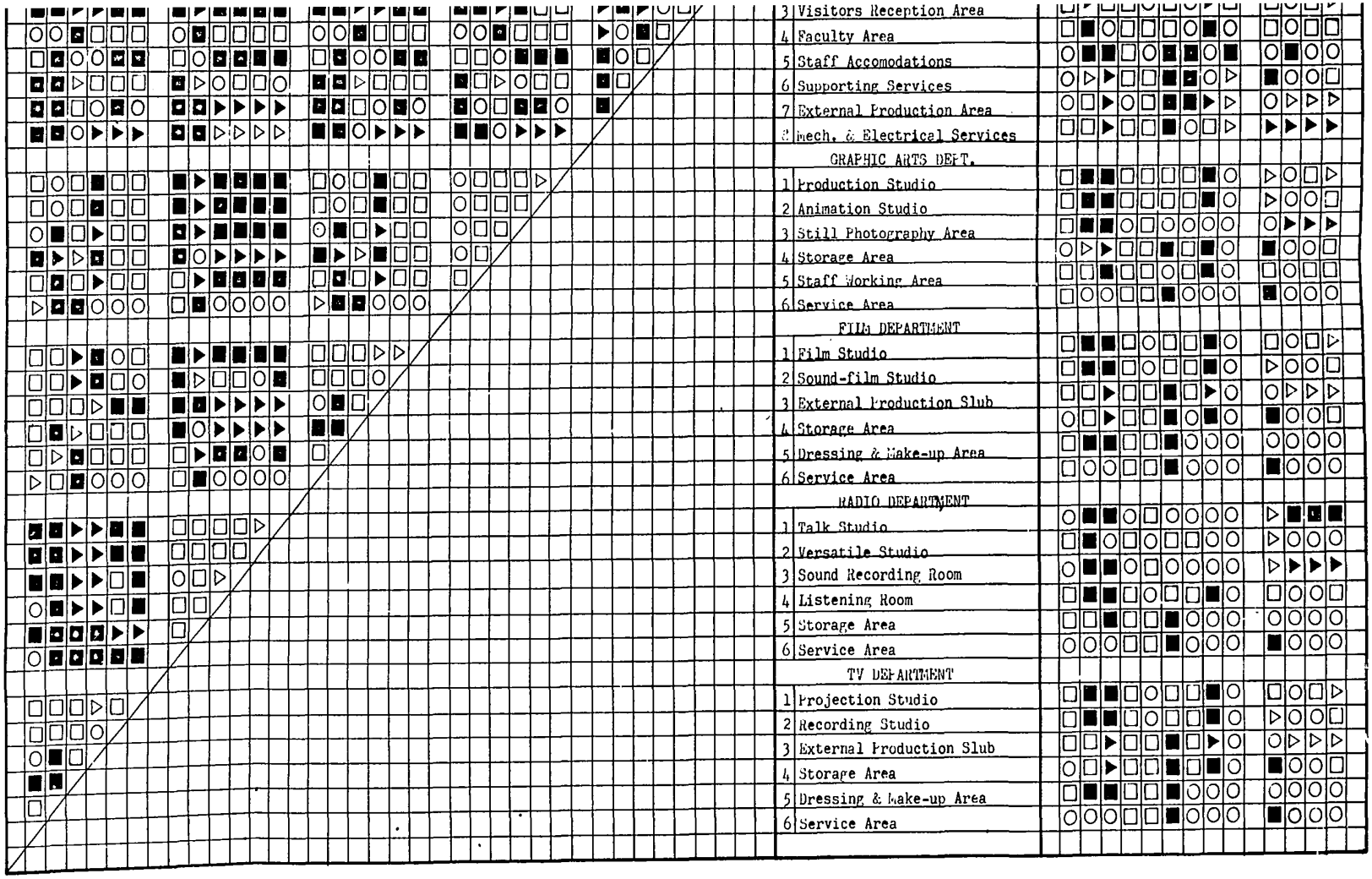
RELATIONSHIPS MATRIX OF MAIN SPACES

SUB-UNIT V

	GROWTH CRITERIA	1 Internal Flexibility	2 Internal Adaptability	3 External Expansion	TECHNICAL CRITERIA	1 Special Acoustic Treatment	2 Special Fire Rating	3 Special Lighting System	4 Special Circuitry System	5 Special Air Cond. System	6 Special Treatment for Handicapped
ENVIRONMENTAL CRITERIA											
1	Natural Light	△	□	△		□	○	□	△	▲	
2	View - Out	□	□	□		□	○	○	△	▲	
3	View - In	○	○	○		○	■	○	△	▲	
4	Quiet Surrounding	○	○	□		□	○	■	○	▲	
LOCATION CRITERIA											
1	Main Floor Location	△	○	□		○	■	△	△	△	
2	Underground Location	▲	■	▲		■	○	○	▲	□	
3	Overground Location	○	○	○		○	■	■	■	○	
4	Access to Main Circulation	△	□	□		□	■	■	■	■	
5	Access to Secondary Circul'n.	□	□	○		□	○	□	□	□	
6	Access to Vertical Circul'n.	□	□	□		□	□	□	○	□	
7	Close to Main Entrance	△	○	□		○	■	▲	▲	▲	
8	Close to Delivery Entrance	▲	■	▲		■	■	△	□	□	
9	Close to Emergency Exit	□	□	□		□	○	○	○	□	

	COMMON SPACES	1 Main Lobby	2 Administrative Area	3 Visitors Reception Area	4 Faculty Area	5 Staff Accomodations	6 Supporting Services	7 External Production Area	8 Mech. & Electrical Services
1	Main Lobby								
2	Administrative Area	□							
3	Visitors Reception Area	△	△						
4	Faculty Area	□	□	□					
5	Staff Accomodations	○	○	○	□				
6	Supporting Services	▲	■	▲	■	□			
7	External Production Area	■	■	■	○	○	□		
8	Mechan. & Electr. Services	▲	▲	▲	▲	■	■	■	
	GRAPHIC ARTS DEPT.								
1	Production Studio	■	○	□	□	■	□	○	▲
2	Animation Studio	■	○	□	□	■	□	■	▲
3	Still Photography Area	■	■	■	□	■	○	■	▲
4	Storage Area	▲	▲	▲	■	○	△	□	○
5	Staff Working Area	■	■	■	○	□	□	○	■
6	Service Area	■	■	■	○	□	■	■	■
	FILM DEPARTMENT								
1	Film Studio	■	○	■	□	■	□	○	▲
2	Sound-film Studio	■	○	■	□	■	□	■	▲
3	External Production Slub	■	■	▲	□	○	□	○	▲
4	Storage Area	▲	▲	▲	■	○	△	□	○
5	Dressing & Make-up Area	■	■	■	○	■	■	■	■
6	Service Area	■	■	■	○	□	■	■	■
	RADIO DEPARTMENT								
1	Talk Studio	■	○	■	□	■	○	▲	△
2	Versatile Studio	■	○	■	□	■	□	▲	△
3	Sound Recording Room	■	○	■	□	■	□	▲	△
4	Listening Room	■	○	■	□	■	○	▲	△
5	Storage Area	▲	▲	▲	■	○	△	■	■
6	Service Area	■	■	■	○	□	■	■	■
	TV DEPARTMENT								
1	Projection Studio	■	○	■	□	■	□	○	▲
2	Recording Studio	■	○	■	□	■	□	■	▲
3	External Production Slub	■	■	▲	□	○	□	○	▲
4	Storage Area	▲	▲	▲	■	○	△	□	○
5	Dressing & Make-up Area	■	■	■	○	■	■	■	■
6	Service Area	■	■	■	○	□	■	■	■

	GRAPHIC ARTS DEPT.	1 Production Studio	2 Animation Studio	3 Still Photography Area
1	Production Studio	△		
2	Animation Studio	□	□	
3	Still Photography Area	□	□	□
4	Storage Area	□	□	□
5	Staff Working Area	□	□	□
6	Service Area	○	○	○
	FILM DEPARTMENT			
1	Film Studio	□	□	□
2	Sound-film Studio	□	□	□
3	External Production Slub	■	■	▲
4	Storage Area	□	□	□
5	Dressing & Make-up Area	○	○	■
6	Service Area	□	□	○
	RADIO DEPARTMENT			
1	Talk Studio	■	■	■
2	Versatile Studio	■	■	■
3	Sound Recording Room	■	■	■
4	Listening Room	■	■	■
5	Storage Area	▲	▲	▲
6	Service Area	■	■	■
	TV DEPARTMENT			
1	Projection Studio	□	□	□
2	Recording Studio	□	□	□
3	External Production Slub	■	■	▲
4	Storage Area	□	□	□
5	Dressing & Make-up Area	○	○	■
6	Service Area	□	□	○



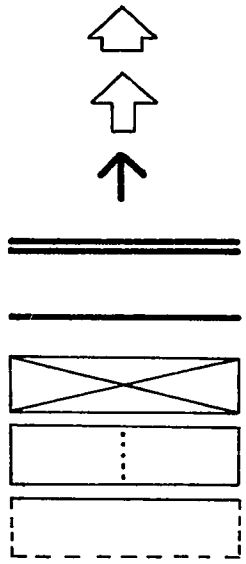
3	Visitors Reception Area
4	Faculty Area
5	Staff Accomodations
6	Supporting Services
7	External Production Area
8	Mech. & Electrical Services
	GRAPHIC ARTS DEPT.
1	Production Studio
2	Animation Studio
3	Still Photography Area
4	Storage Area
5	Staff Working Area
6	Service Area
	FILM DEPARTMENT
1	Film Studio
2	Sound-film Studio
3	External Production Slub
4	Storage Area
5	Dressing & Make-up Area
6	Service Area
	RADIO DEPARTMENT
1	Talk Studio
2	Versatile Studio
3	Sound Recording Room
4	Listening Room
5	Storage Area
6	Service Area
	TV DEPARTMENT
1	Projection Studio
2	Recording Studio
3	External Production Slub
4	Storage Area
5	Dressing & Make-up Area
6	Service Area

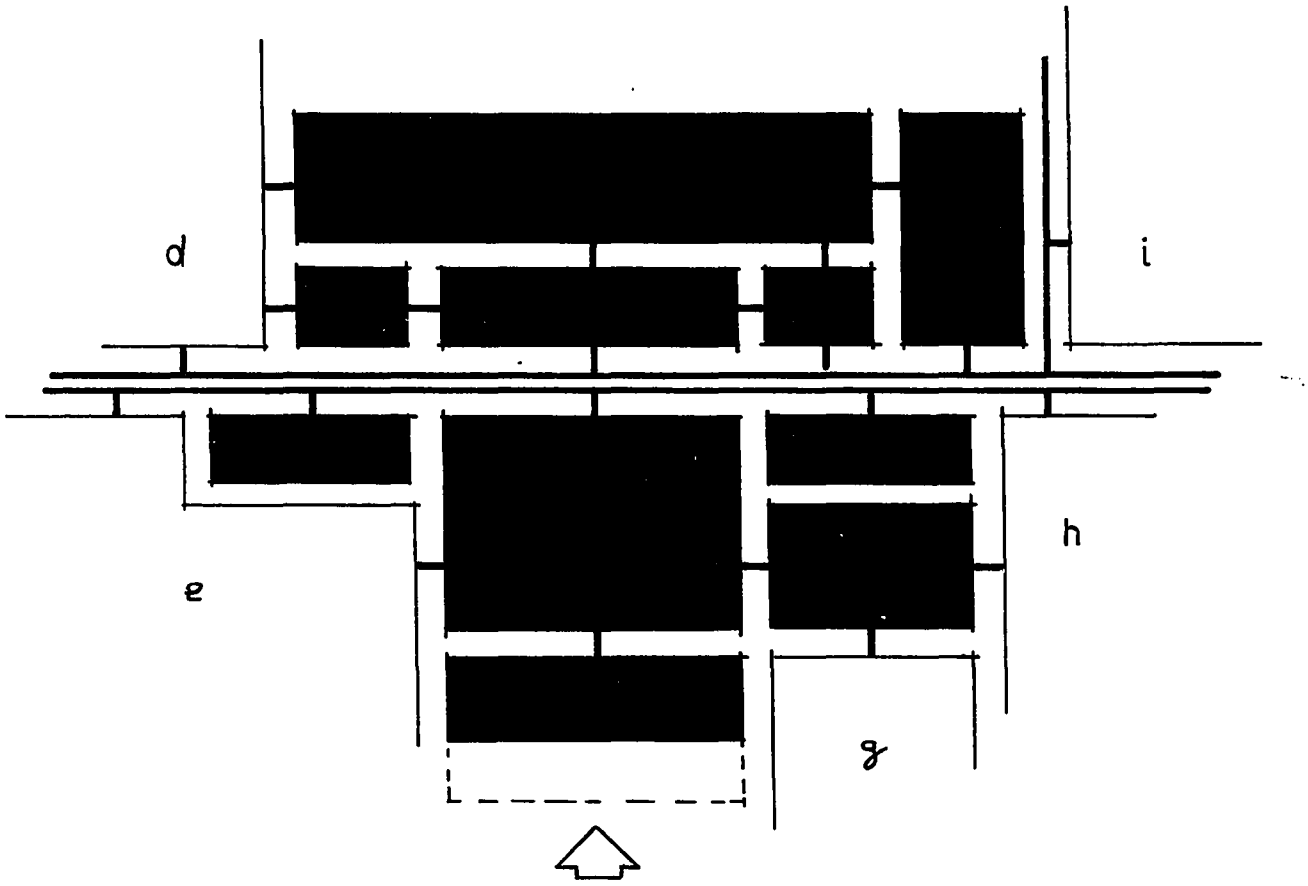
c) Design Concepts Resulting from the Relationships Matrix of Main Spaces

The second design method is the space grouping, which is a graphic statement (series of diagrams) of all the main design concepts arising from the relationships matrix of main spaces.

The symbols which appear in all the following diagrams are:

1) Access to pedestrian entrance
2) Access to delivery entrance
3) Emergency exit
4) Main circulation
5) Secondary circulation
6) Vertical circulation
7) Internal flexibility
8) Future external expansion





a. ENTRANCE (stairs to basement, drop-in pockets)

b. MAIN LOBBY (checking, new books display, information)

c. CIRCULATION DEPARTMENT.

- c_1 counter.
- c_2 reserve area.
- c_3 lost and found.
- c_4 staff working area.
- c_5 staff lounge.

d. TECHNICAL SERVECES DEPARTMENT.

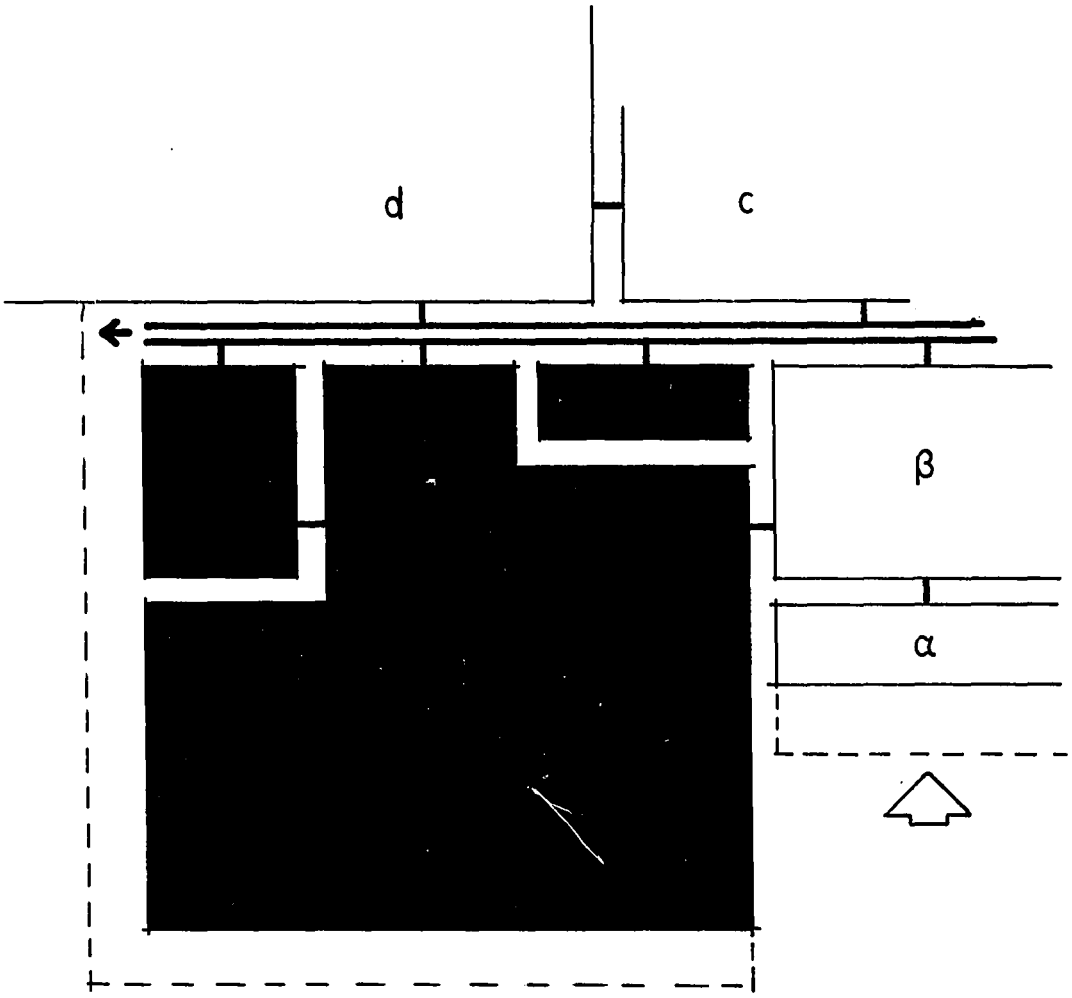
e. REFERENCE DEPARTMENT.

f. FOYER.

g. ART COLLECTION AND DISPLAY AREA.

h. AUDITORIUM.

i. PRODUCTION LABORATORIES DEPARTMENT.



a. ENTRANCE.

b. MAIN LOBBY.

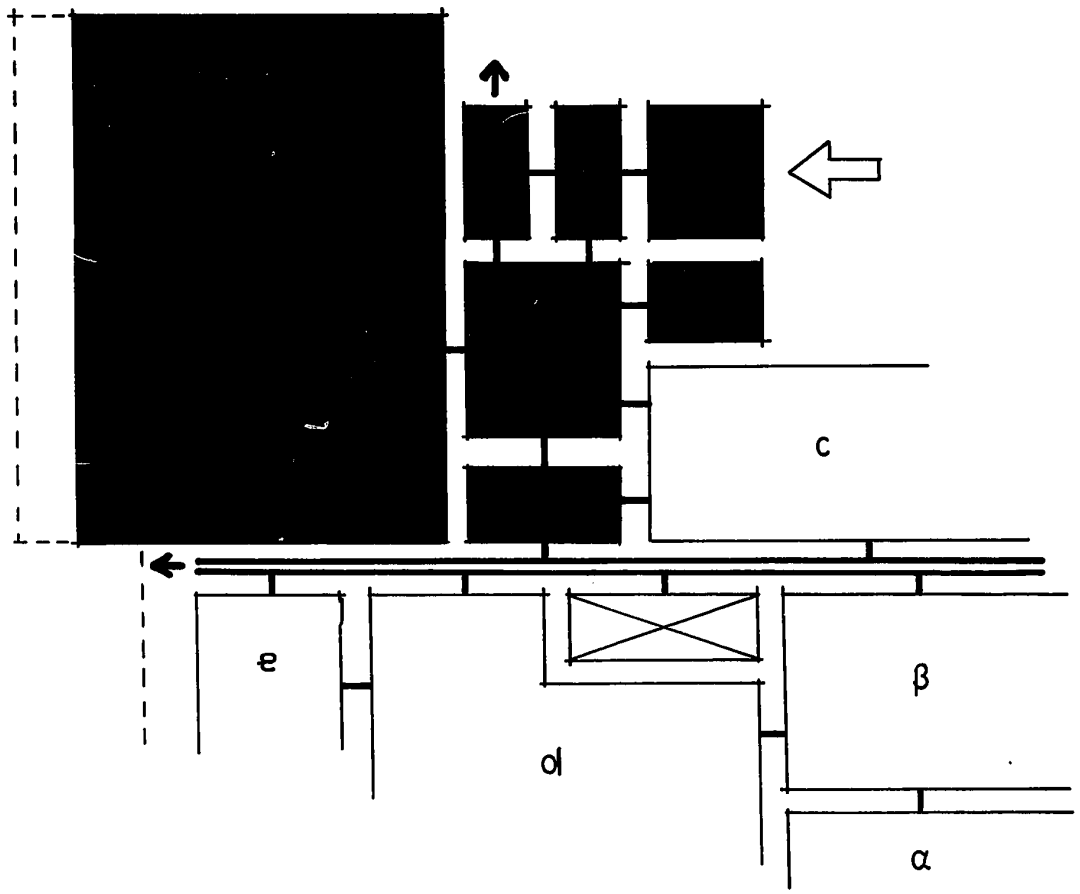
c. CIRCULATION DEPARTMENT.

d. TECHNICAL SERVICES DEPARTMENT.

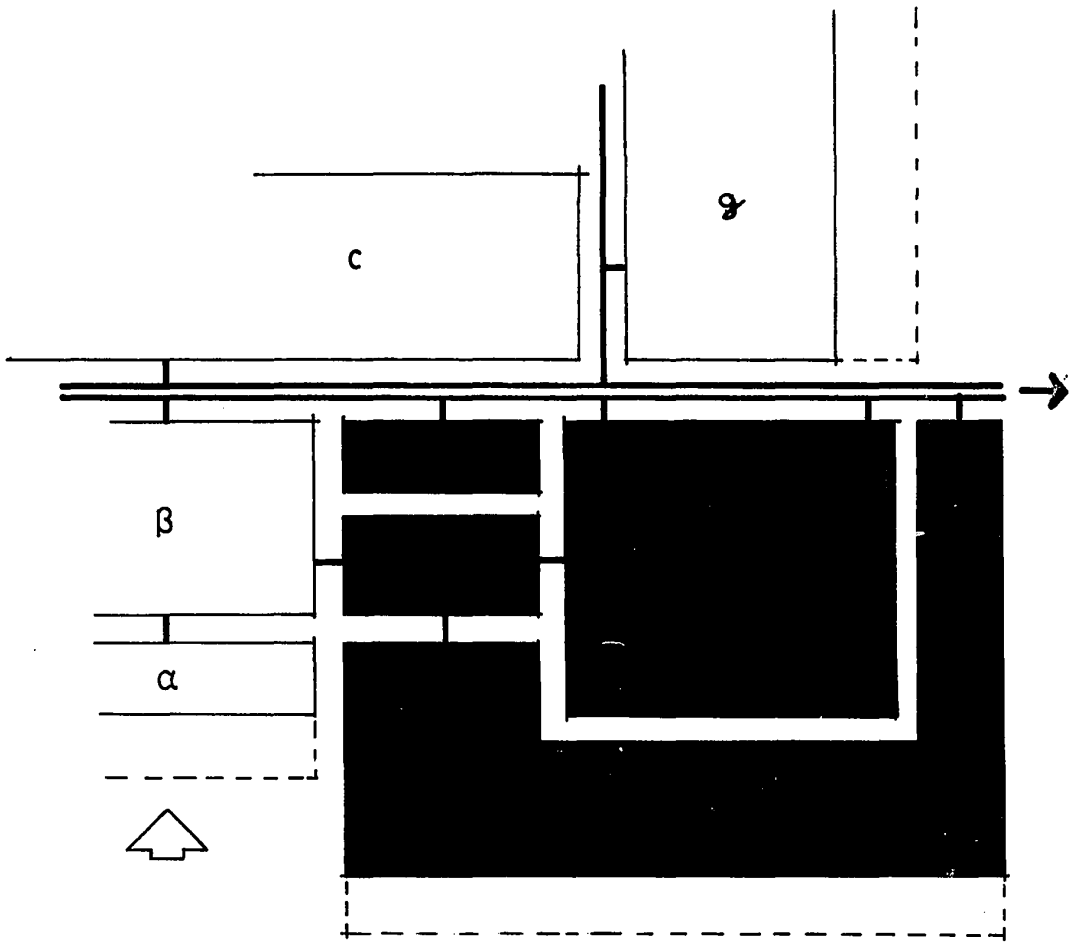
e. REFERENCE DEPARTMENT.

- e_1 card catalogues.
- e_2 desk.
- e_3 reading area.

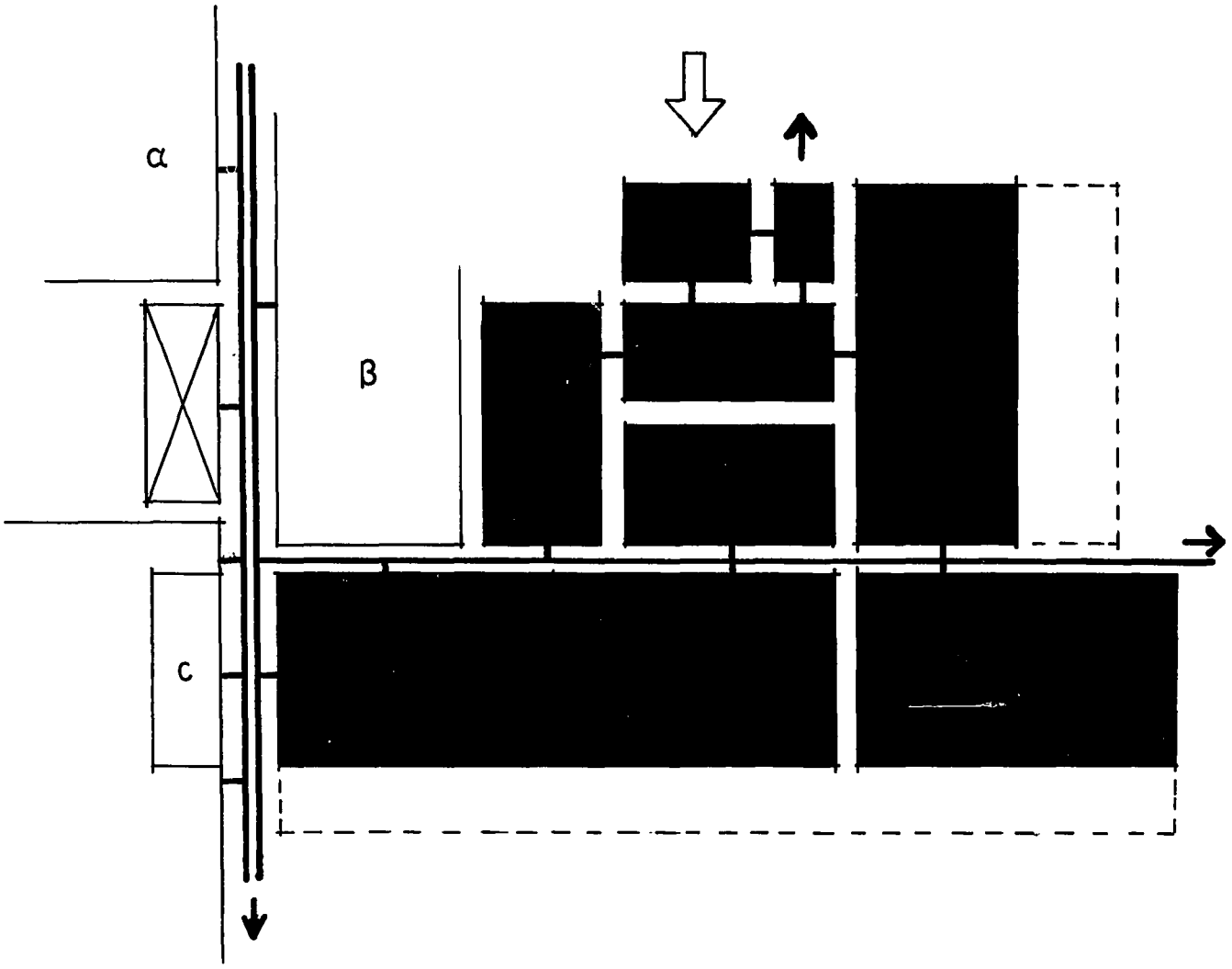
f. INFORMATION STORAGE AND RETRIEVAL.



a. ENTRANCE.
b. MAIN LOBBY.
c. CIRCULATION DEPARTMENT.
d. REFERENCE DEPARTMENT.
e. INFORMATION STORAGE AND RETRIEVAL.
f. TECHNICAL SERVICES DEPARTMENT.
   f_1 loading area.
   f_2 delivery and shipping room.
   f_3 clerical area.
   f_4 offices.
   f_5 A.V. hardware storage area.
   f_6 staff area.



a. ENTRANCE.
b. MAIN LOBBY.
c. CIRCULATION DEPARTMENT.
d. FOYER.
e. ART COLLECTION AND DISPLAY AREAS.
f. AUDITORIUM. (500 - 600)
   f_1 audience area.
   f_2 preparation and storage.
g. PRODUCTION LABORATORIES DEPARTMENT.



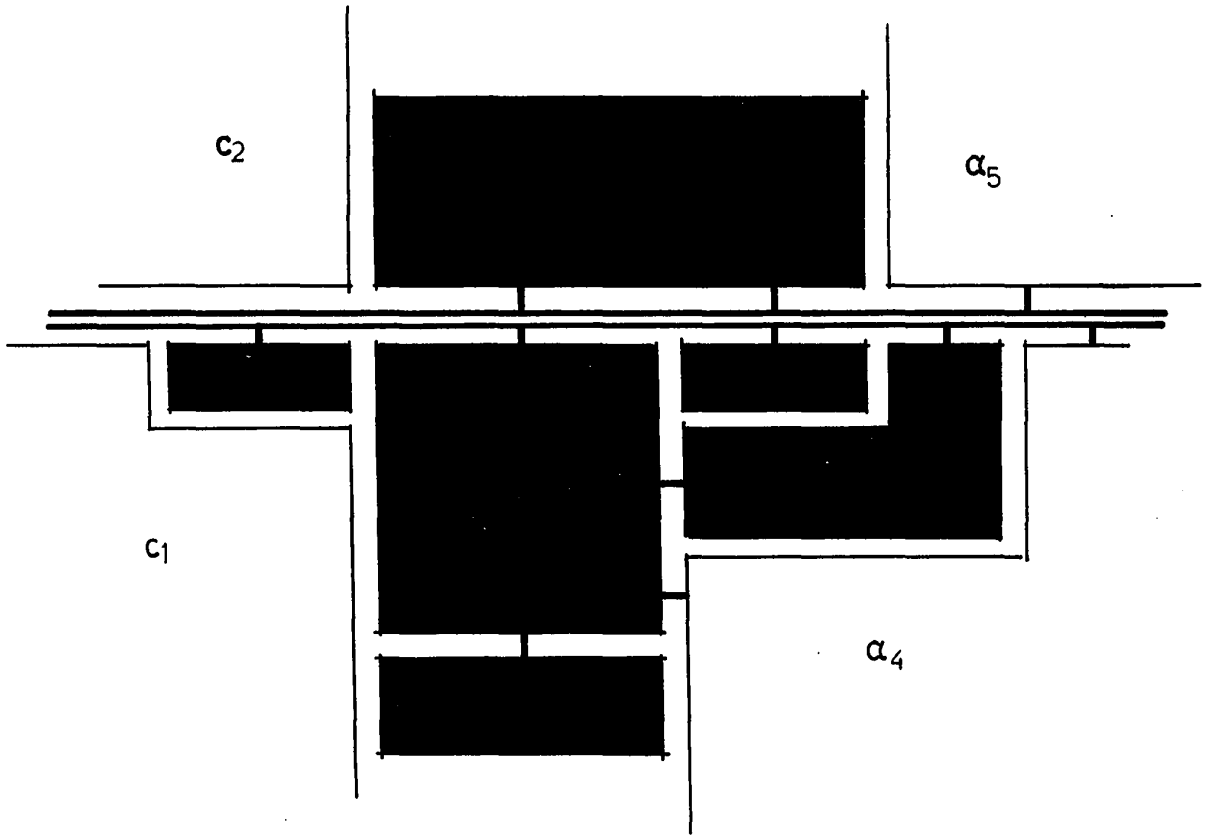
a. MAIN LOBBY.

b. CIRCULATION DEPARTMENT.

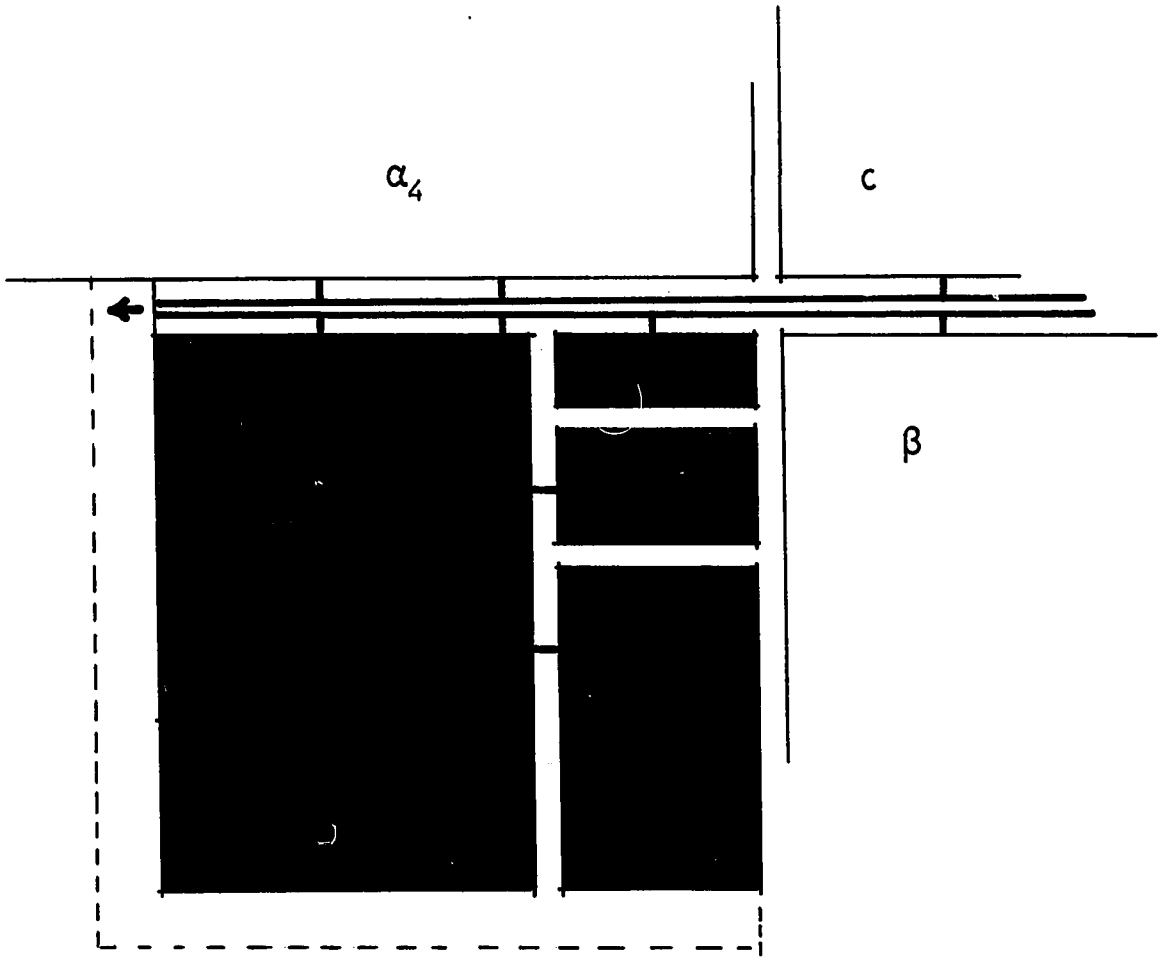
c. AUDITORIUM (preparation and storage area).

d. PRODUCTION LABORATORIES DEPARTMENT.

- d_1 I.M. production laboratories.
- d_2 students' production laboratories.
- d_3 dark room.
- d_4 general storage area.
- d_5 delivery and shipping room.
- d_6 loading area.



a. GENERAL SERVICE AREA.
   a_1 lobby (tel.- exhibition and display area).
   a_2 cloakroom.
   a_3 toilets.
   a_4 student lounge.
   a_5 student lockers.
b. STAFF ACCOMODATIONS.
c. FACULTY OF LIBRARY SCIENCE.
   c_1 administrative and teaching area.
   c_2 library.

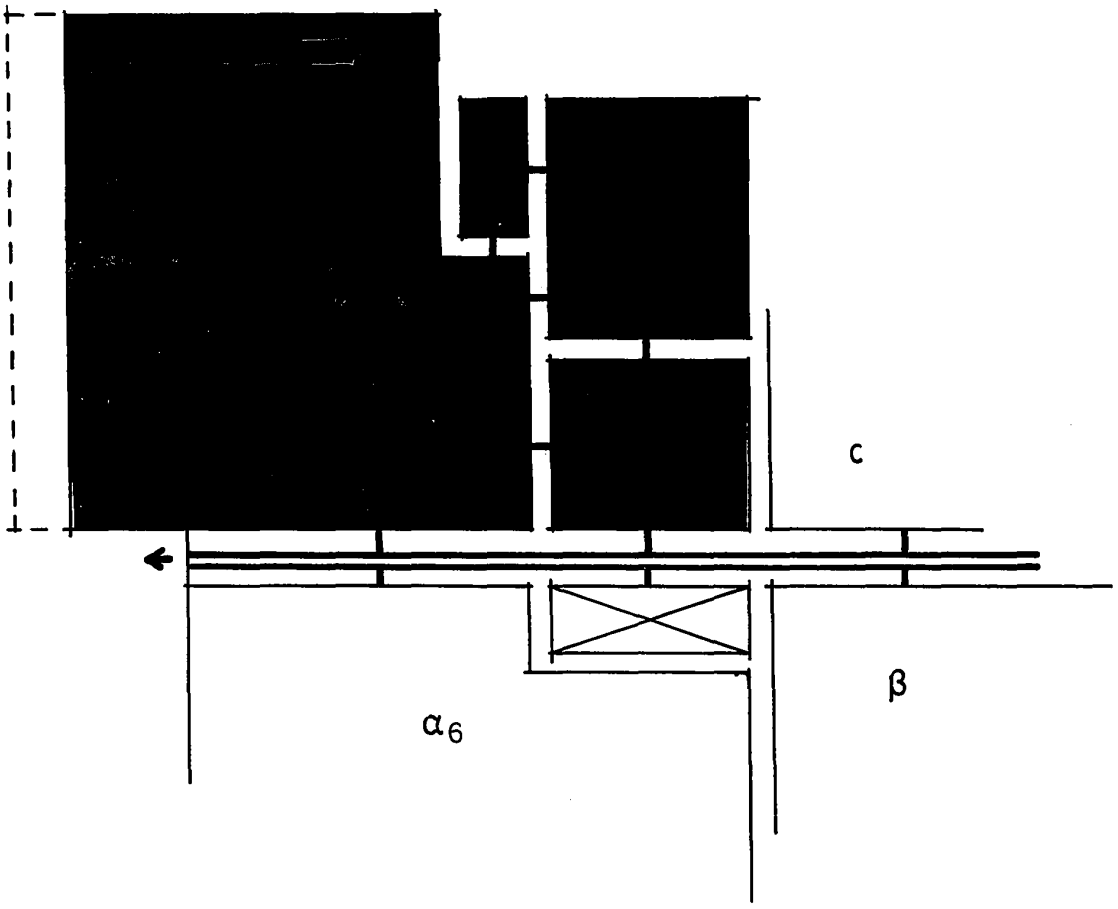


a. FACULTY OF LIBRARY SCIENCE.

- a_1 teaching rooms.
- a_2 administrative area.
- a_3 toilets.
- a_4 library.

b. GENERAL SERVICE AREA.

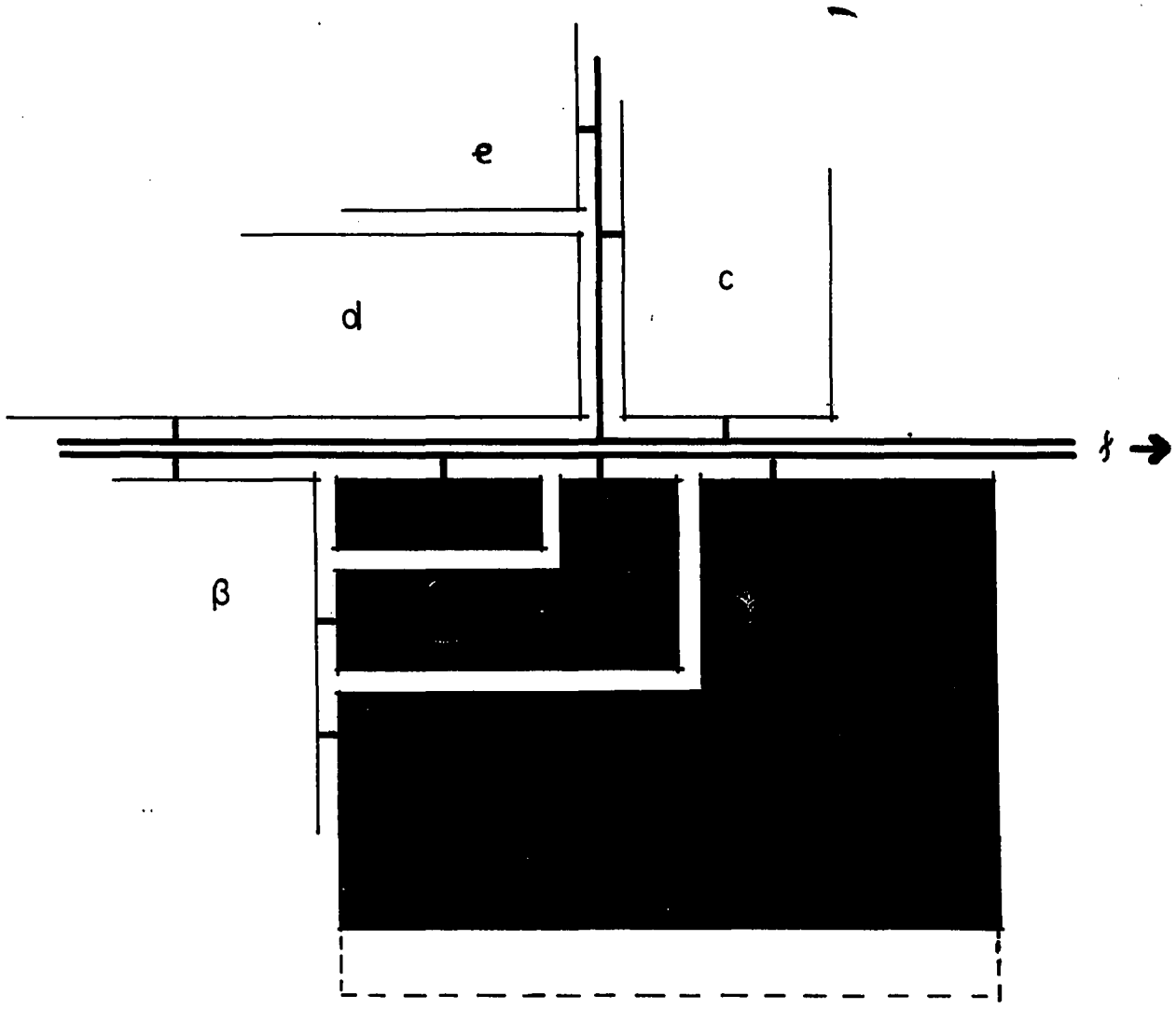
c. STAFF ACCOMODATIONS.



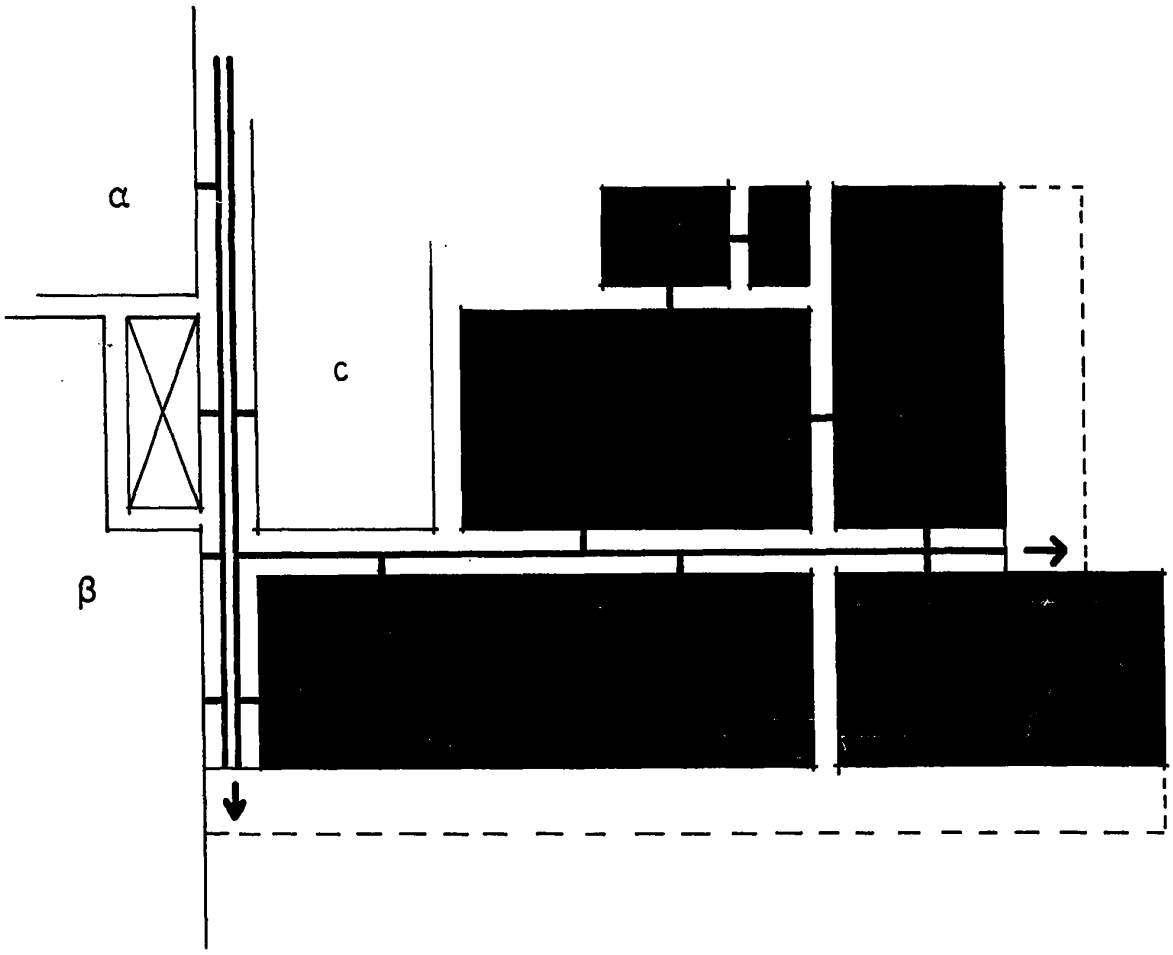
a. FACULTY OF LIBRARY SCIENCE.
   - a_1 bookstacks.
   - a_2 reading area.
   - a_3 circulation area.
   - a_4 delivery and clerical room.
   - a_5 offices.
   - a_6 administrative and teaching area.

b. GENERAL SERVICE AREA.

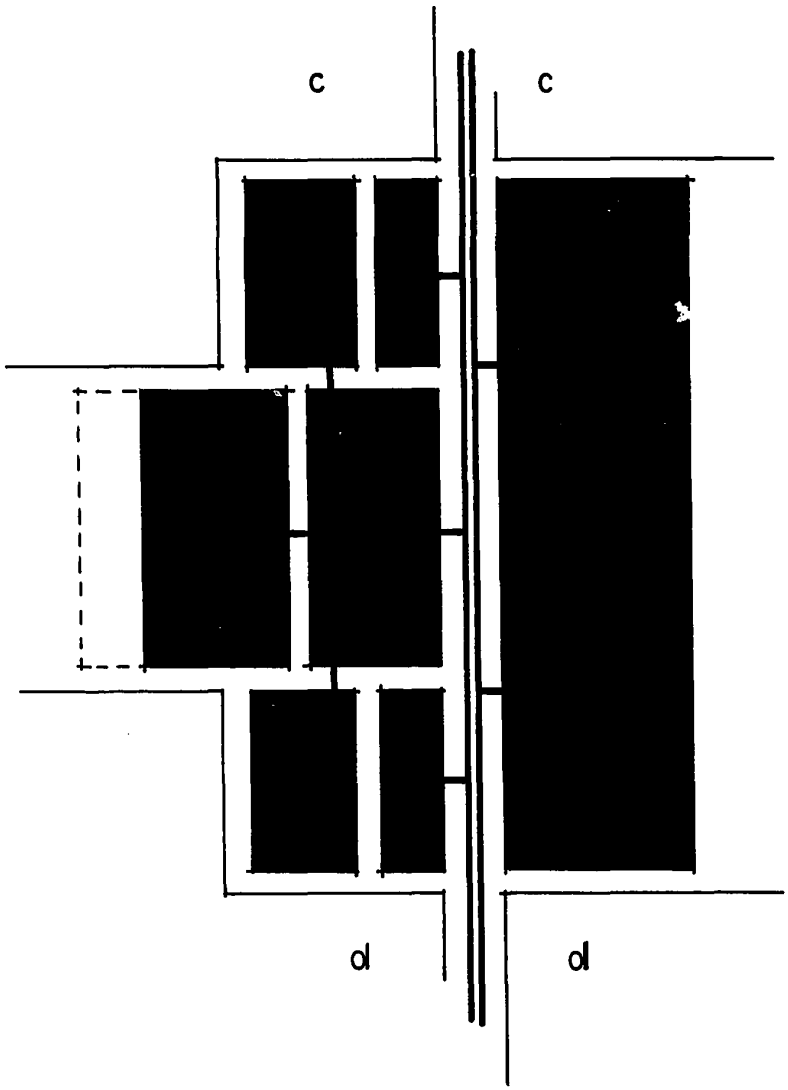
c. STAFF ACCOMODATIONS.



a. STUDENT LOUNGE.
   a_1 sitting area.
   a_2 vending machine area.
   a_3 toilets.
b. GENERAL SERVICE AREA.
c. STUDENT LOCKERS.
d. STAFF ACCOMODATIONS.
e. GENERAL STORAGE AREA.
f. CONNECTION WITH SUB-UNIT V (if needed).



a. GENERAL SERVICE AREA.
b. STUDENT LOUNGE AREA.
c. STAFF ACCOMODATIONS.
d. STUDENT LOCKERS.
e. GENERAL STORAGE AREA.
   e_1 delivery room.
   e_2 storage room.
f. MECHANICAL ROOM (Stairs to basement 'B')
g. ELECTRICAL ROOM.



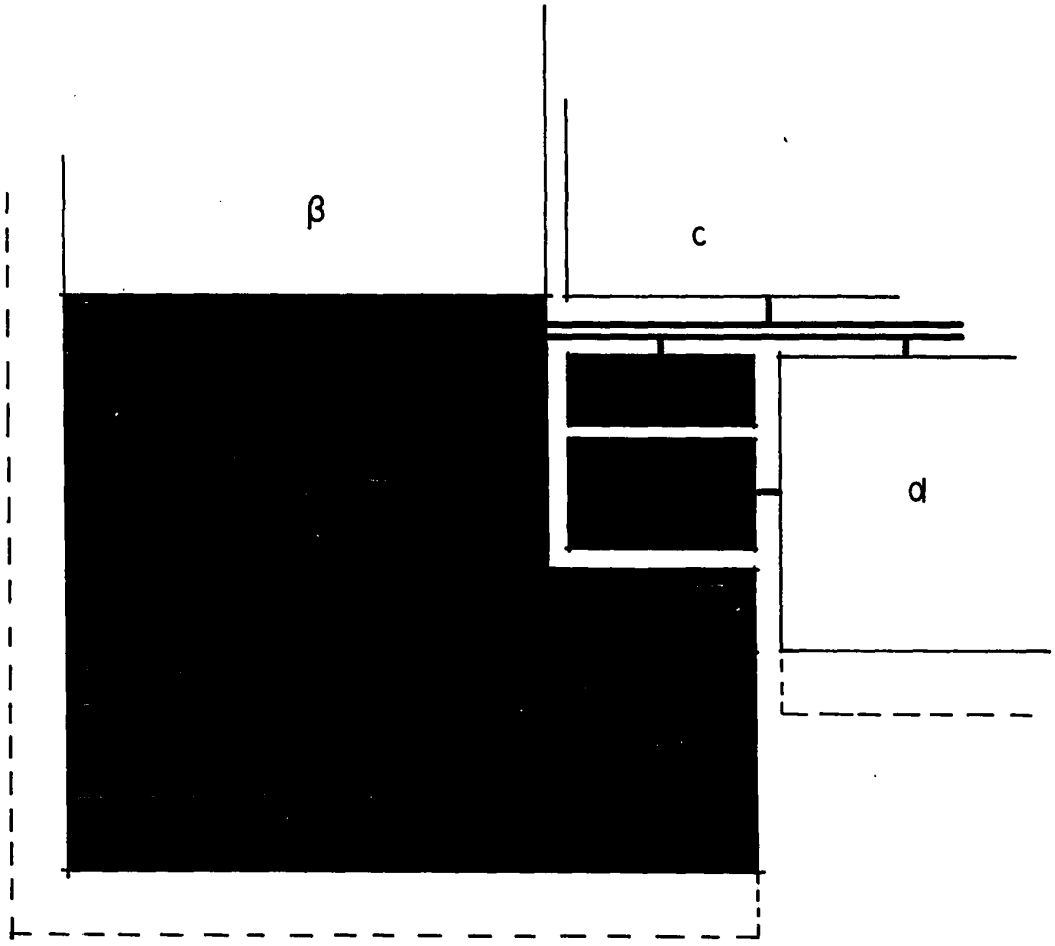
a. ADMINISTRATIVE OR FACULTY AREA.

b. GENERAL SERVICE AREA. (tel. - x.c.)

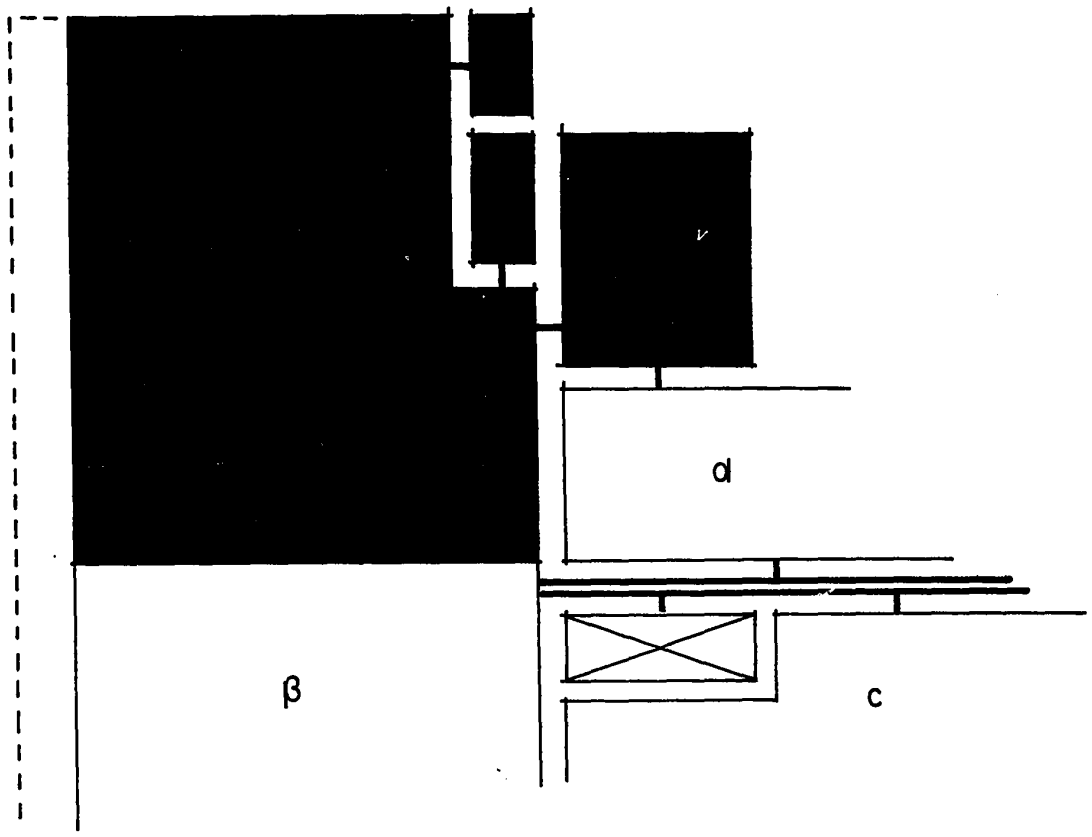
- b_1 lobby.
- b_2 smoker-lounge.
- b_3 toilets.

c. LIBRARY INFORMATION RETRIEVAL CENTRE.

d. PRODUCTION - LEARNING - TEACHING CENTRE.



a. CURRENT PERIODICALS DEPARTMENT.
   a_1 reading area.
   a_2 microfilm reading room.
   a_3 microfilm area.
b. GOVERNMENT DOCUMENTS DEPARTMENT.
c. ADMINISTRATIVE AREA.
d. GENERAL SERVICE AREA.
e. TOILETS.



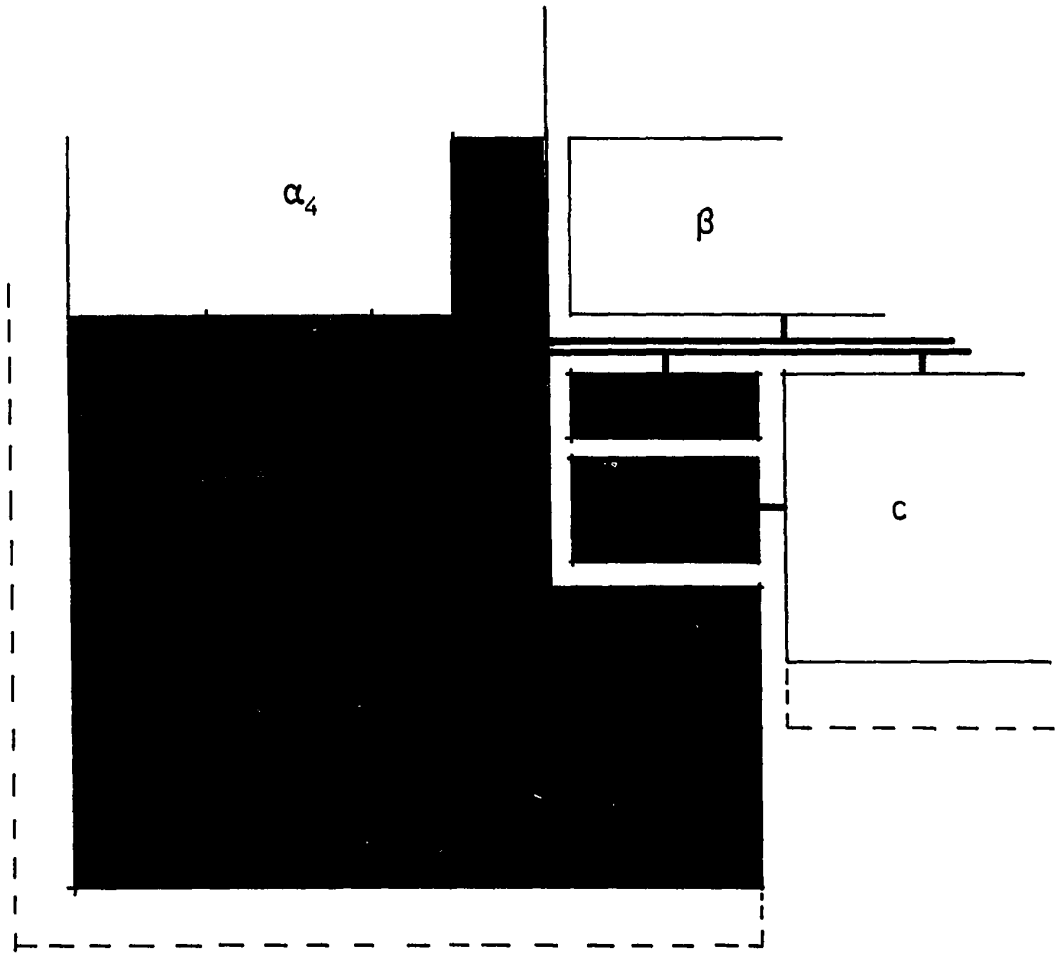
a. GOVERNMENT DOCUMENTS DEPARTMENT.
   - a_1 government documents area.
   - a_2 archives area.
   - a_3 typing room.

b. CURRENT PERIODICALS DEPARTMENT.

c. GENERAL SERVICE AREA.

d. ADMINISTRATIVE OR FACULTY AREA.

e. STAFF AREA.

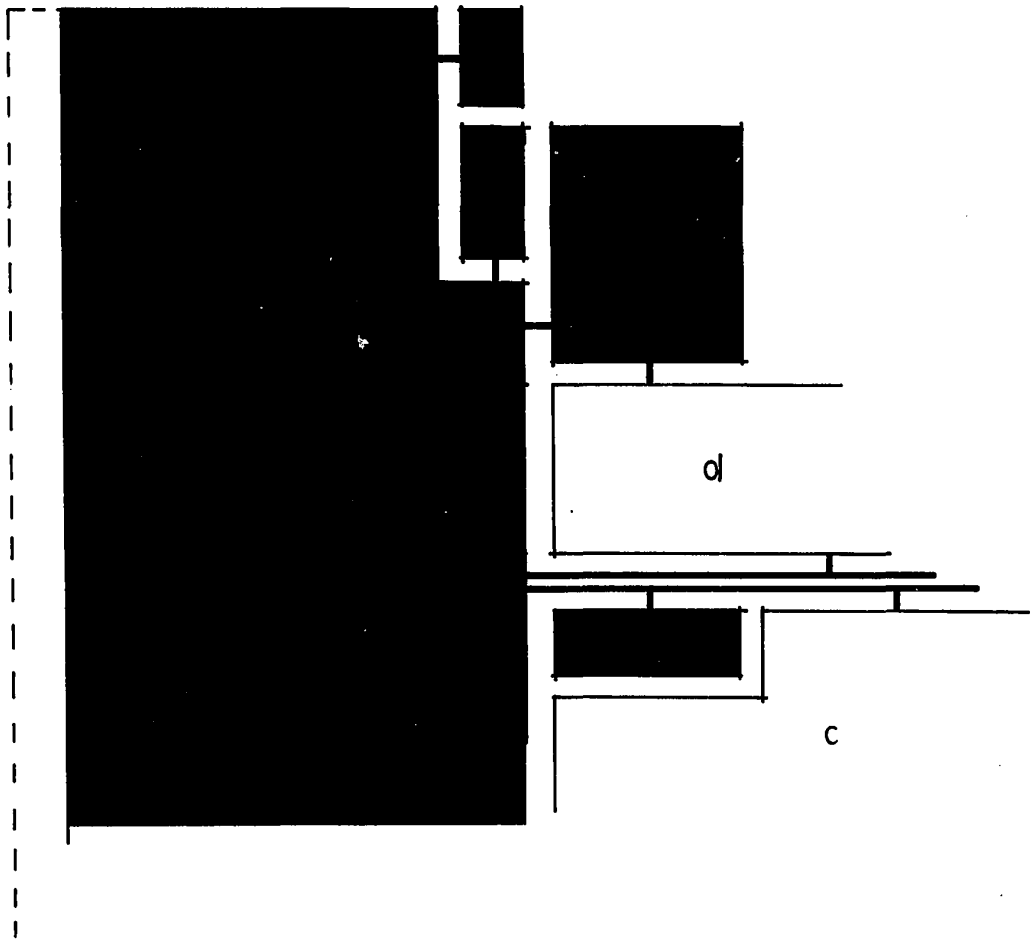


a. AUDIO-VISUAL DEPARTMENT.
   - a_1 A.V. case study area.
   - a_2 A.V. materials shelving area.
   - a_3 music collection and listening area.
   - a_4 A.V. case study rooms.
   - a_5 A.V. software.

b. FACULTY AREA.

c. GENERAL SERVICE AREA.

d. TOILETS.



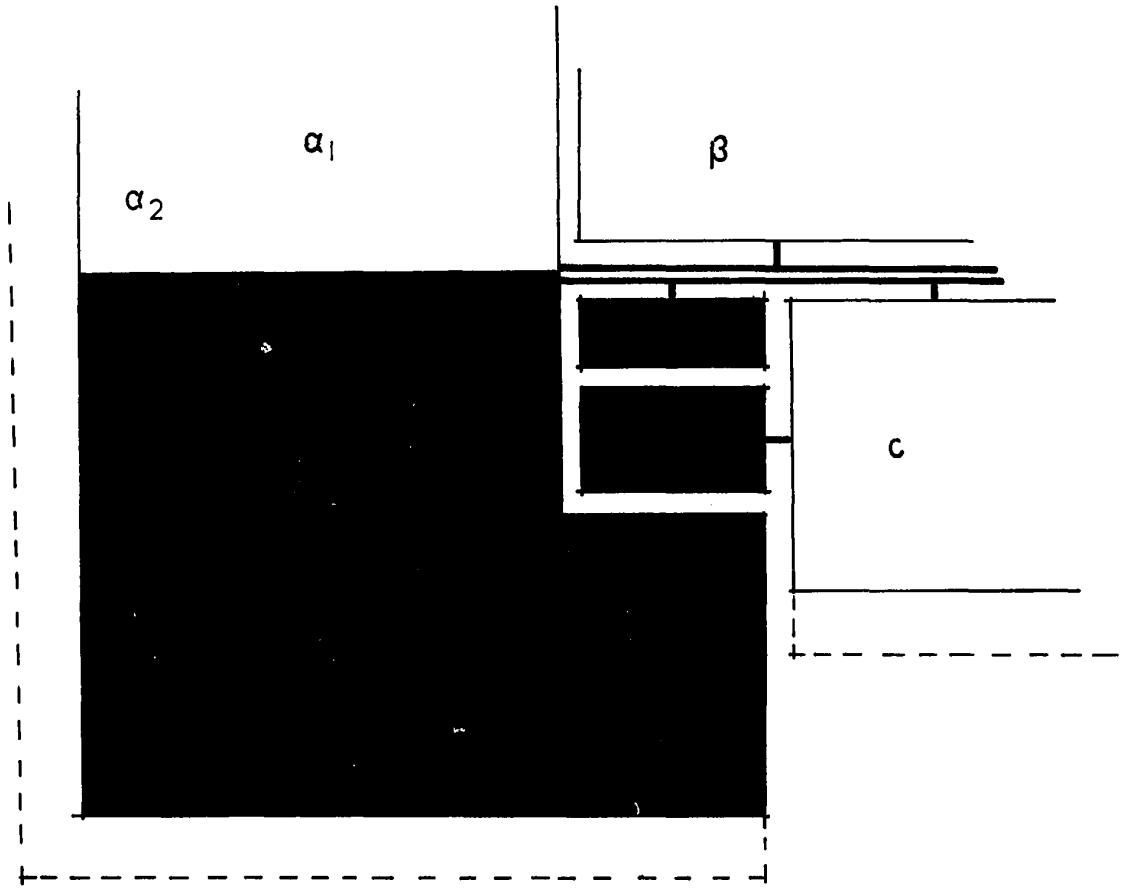
a. AUDIO-VISUAL DEPARTMENT.

- a_1 A.V. case study rooms.
- a_2 A.V. case study area.
- a_3 A.V. materials shelving area.
- a_4 A.V. software.
- a_5 typing room.

b. A.V.STAFF AREA.

c. GENERAL SERVICE AREA.

d. FACULTY AREA.



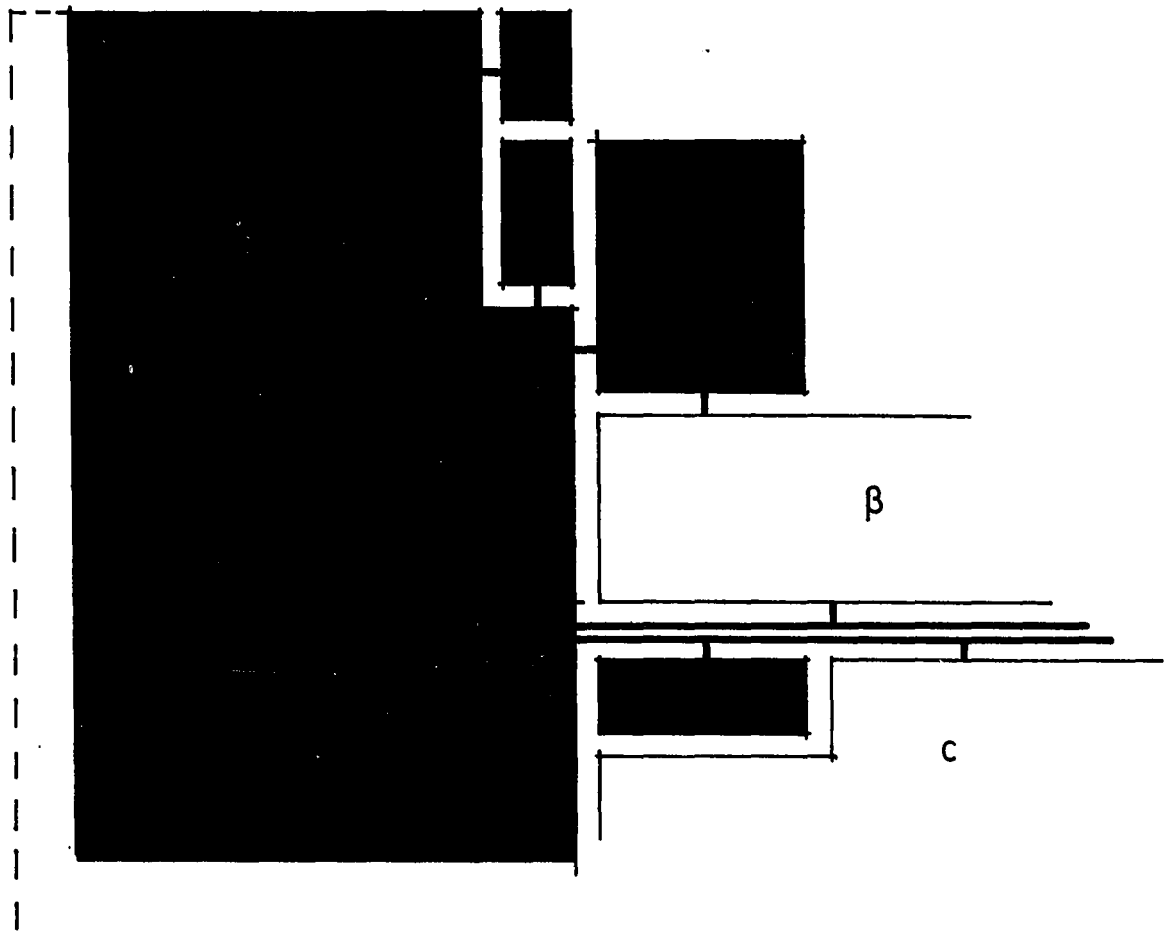
a. CONVENTIONAL LIBRARY.

- a_1 book stacks.
- a_2 reading area.
- a_3 seminar room.
- a_4 lande room.

b. FACULTY AREA.

c. GENERAL SERVICE AREA.

d. TOILETS.

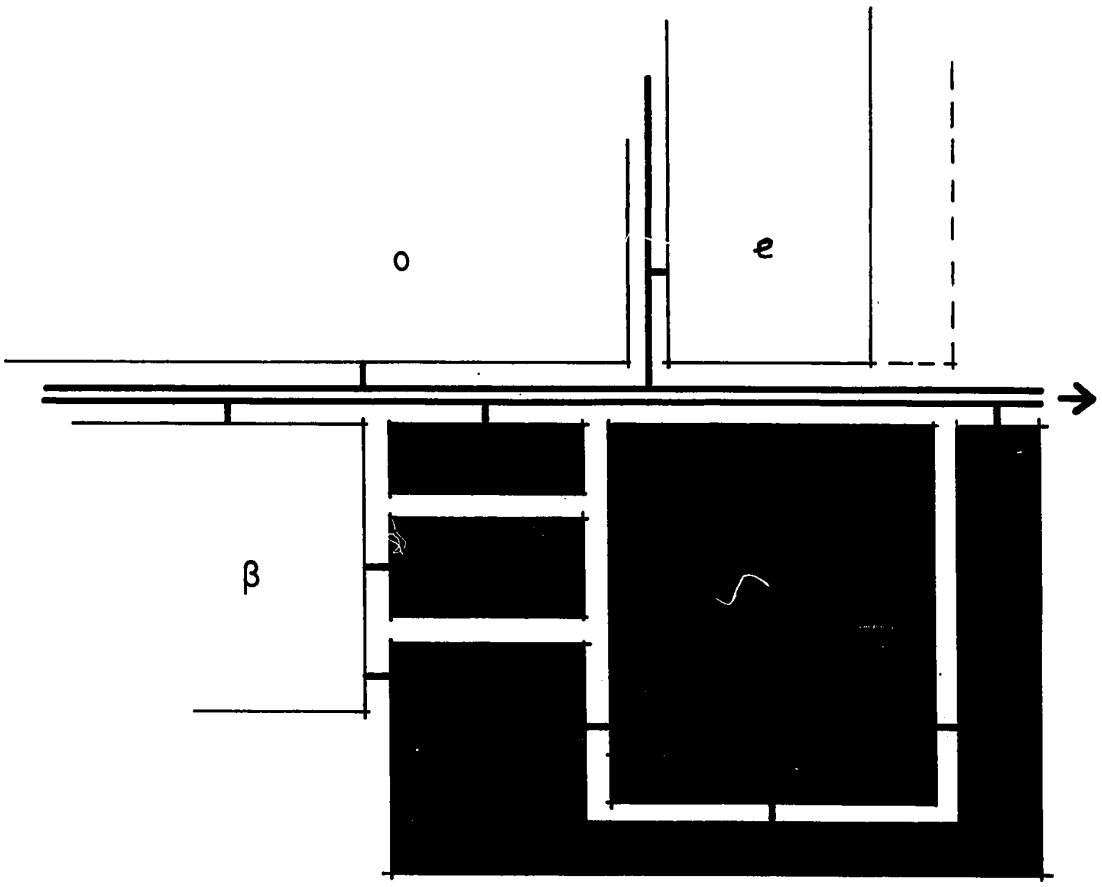


a. CONVENTIONAL LIBRARY.
   - a_1 book stacks.
   - a_2 reading area.
   - a_3 seminar room.
   - a_4 typing room.

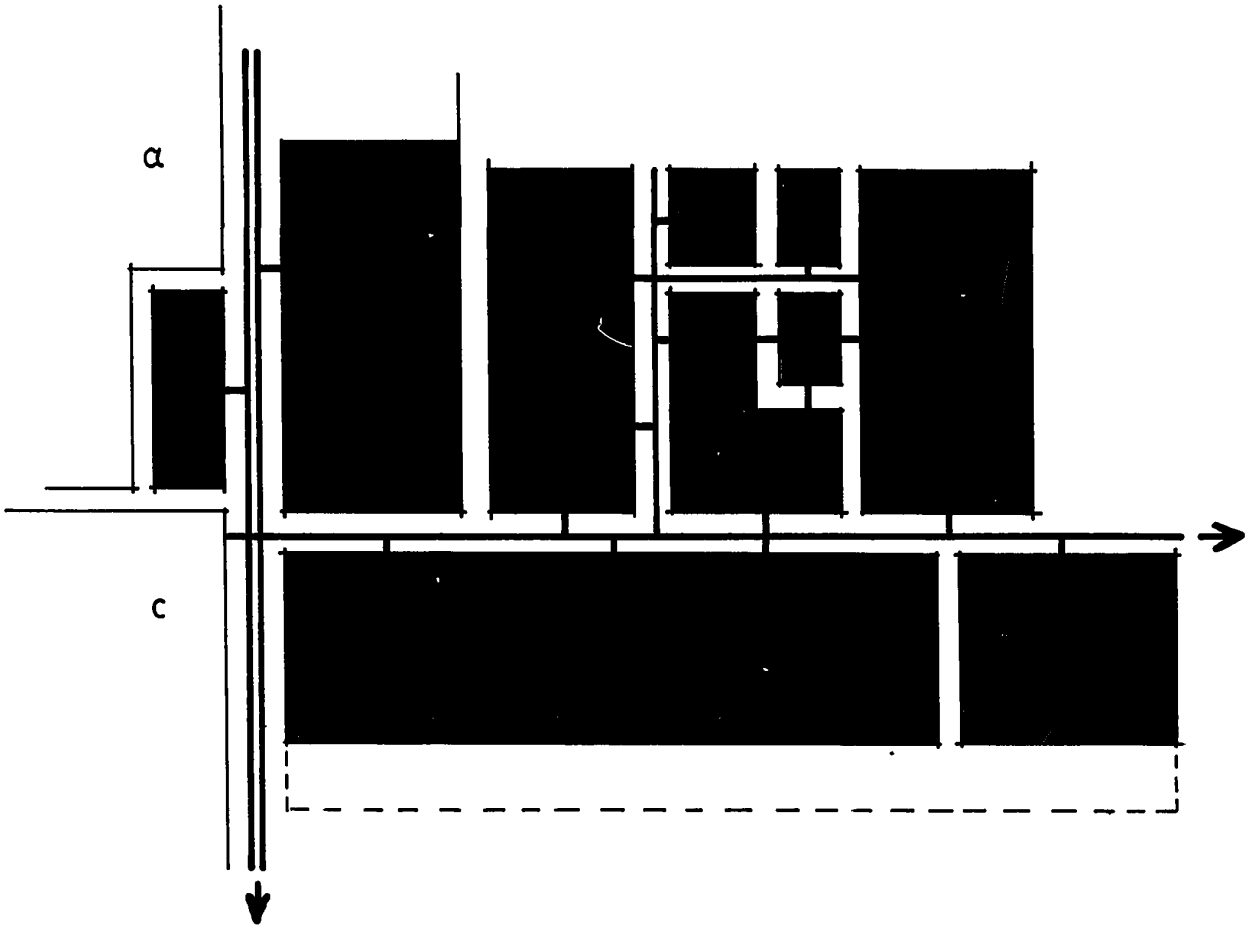
b. FACULTY AREA.

c. GENERAL SERVICE AREA.

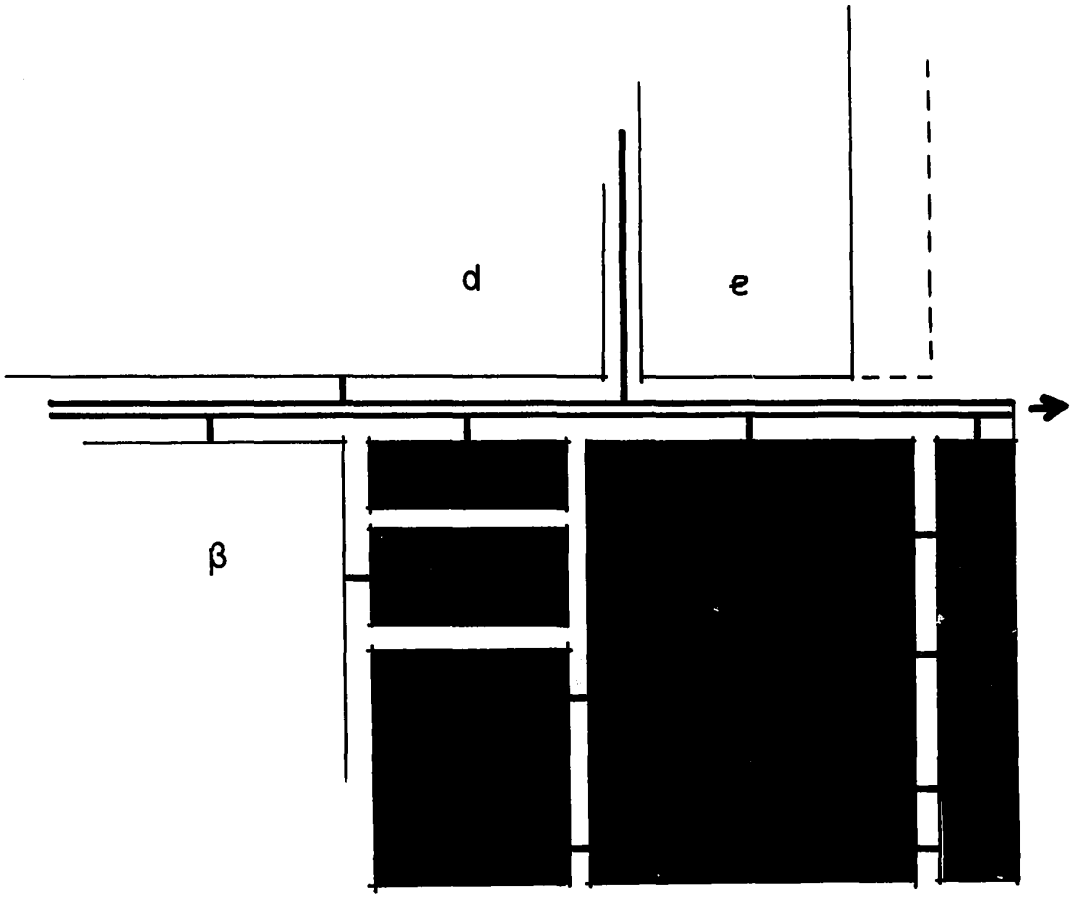
d. STAFF AREA.



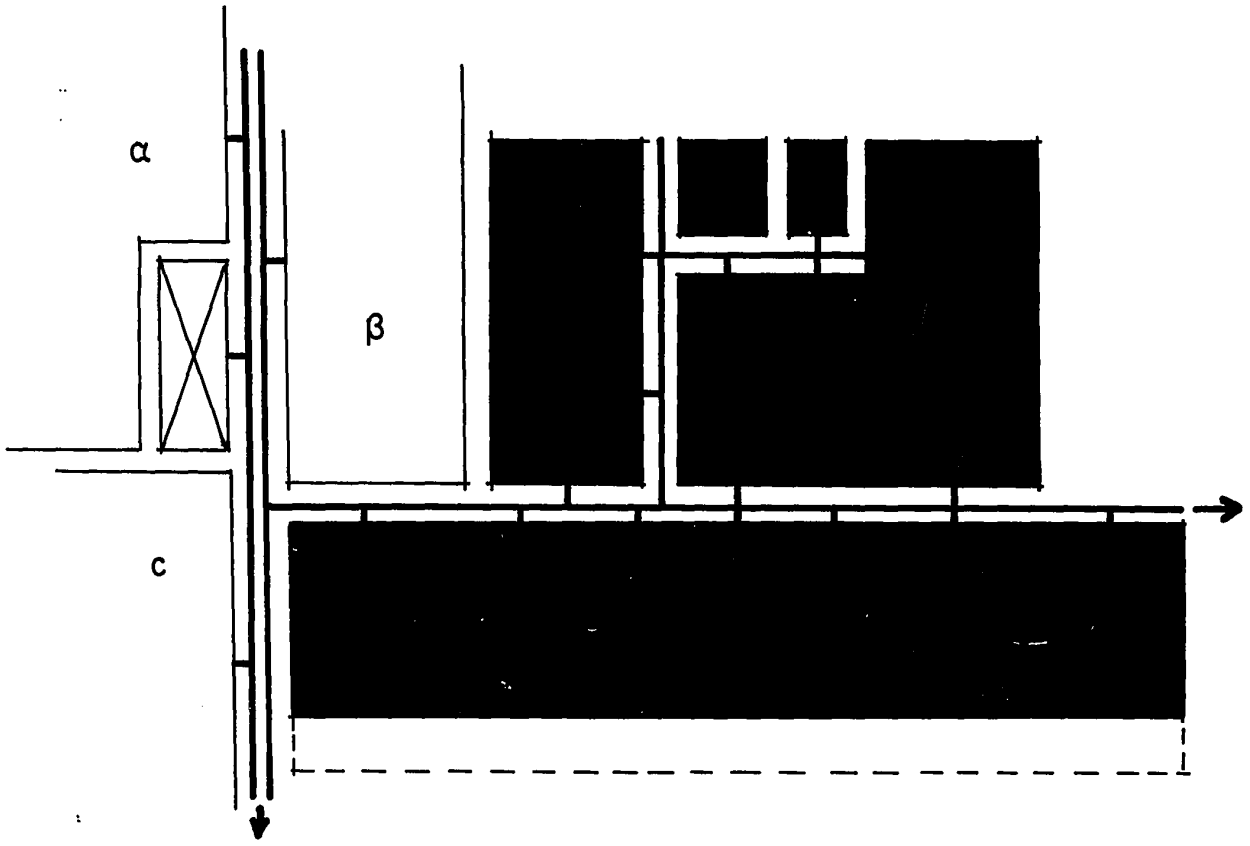
a. AUDITORIUM (500 - 600)
   a_1 audience.
   a_2 projection room.
   a_3 foyer.
b. GENERAL SERVICE AREA.
c. TOILETS.
d. ADMINISTRATIVE AREA.
e. LANGUAGE LABORATORIES DEPARTMENT.



a. GENERAL SERVICE AREA.
b. ADMINISTRATIVE AREA.
c. AUDITORIUM (500 - 600)
d. LECTURE ROOM.
   d_1 audience area.
   d_2 rear projection area.
e. LANGUAGE LABORATORY.
f. CONTROL ROOM.
g. RECITATION ROOM.
h. ASSEMBLY ROOM.
i. TOILETS.



a. SPECIAL DISPLAY AND DEMONSTRATION AREA.
   a_1 auditorium.
   a_2 projection and control room.
   a_3 mechanical, electrical and storage room.
   a_4 foyer.
b. GENERAL SERVICE AREA.
c. TOILETS.
d. FACULTY AREA.
e. CURRICULUM LABORATORIES DEPARTMENT.



a. GENERAL SERVICE AREA.

b. FACULTY AREA.

c. SPECIAL DISPLAY AND DEMONSTRATION AREA.

d. CURRICULUM LABORATORIES DEPARTMENT.

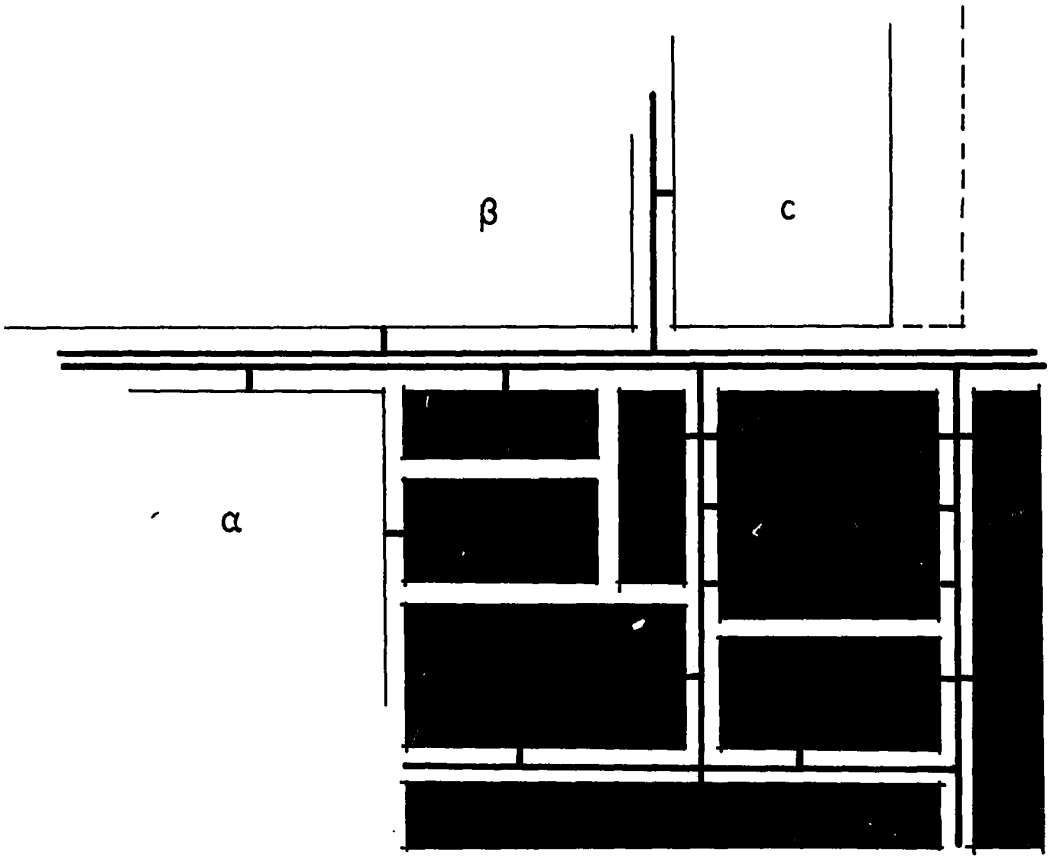
- d_1 laboratory.
- d_2 preparation room.
- d_3 projection and control room.

e. A.V. TEACHING LABORATORY AREA.

- e_1 laboratory.
- e_2 projection room.
- e_3 control room.
- e_4 preparation room.

f. ASSEMBLY ROOM.

g. TOILETS.



a. GENERAL SERVICE AREA.

b. FACULTY AREA.

c. GENERAL TEACHING AREA.

d. COMPUTER BASED TEACHING AND LEARNING AREA.

d_1 seminar room with " Communicator System. " (10 - 15)

d_2 classroom with " Multi-media Control System. " (50)

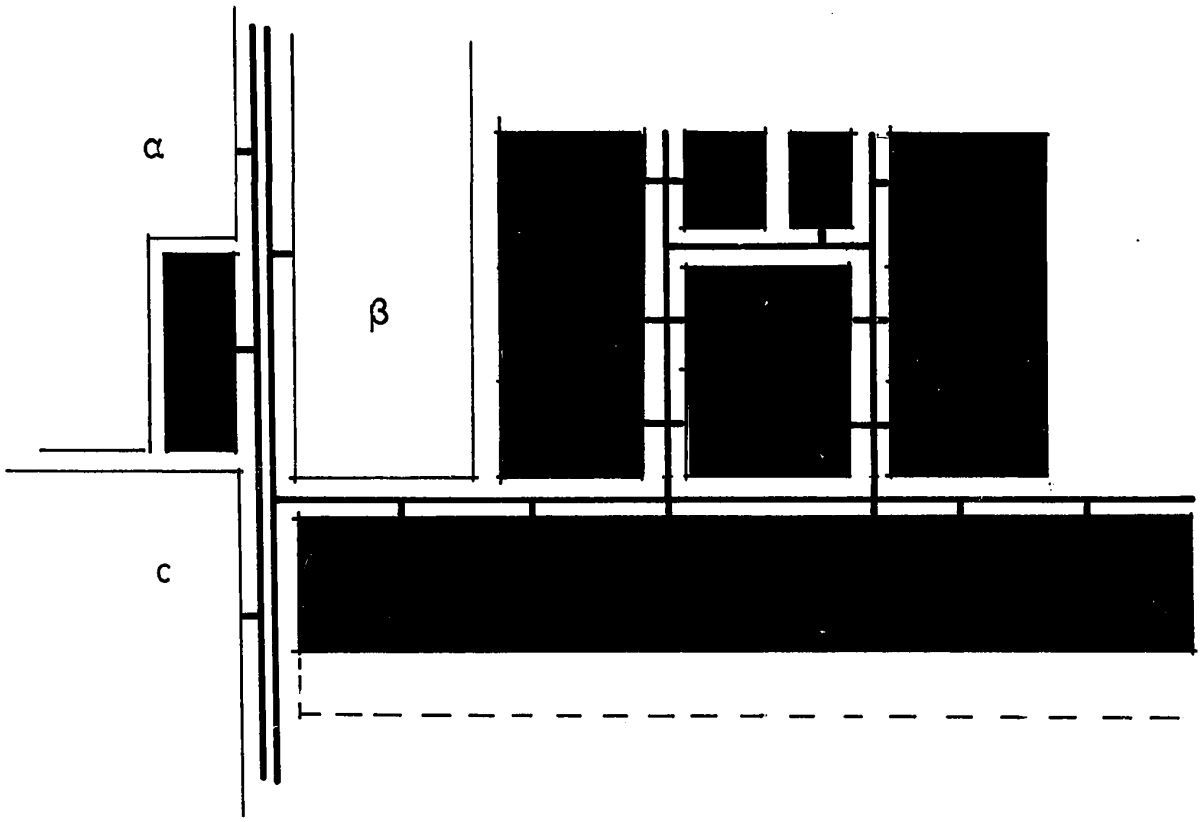
d_3 classroom with " Large Group Response System ." (100)

e. COMPUTER-ASSISTED INDIVIDUAL LEARNING AREA.

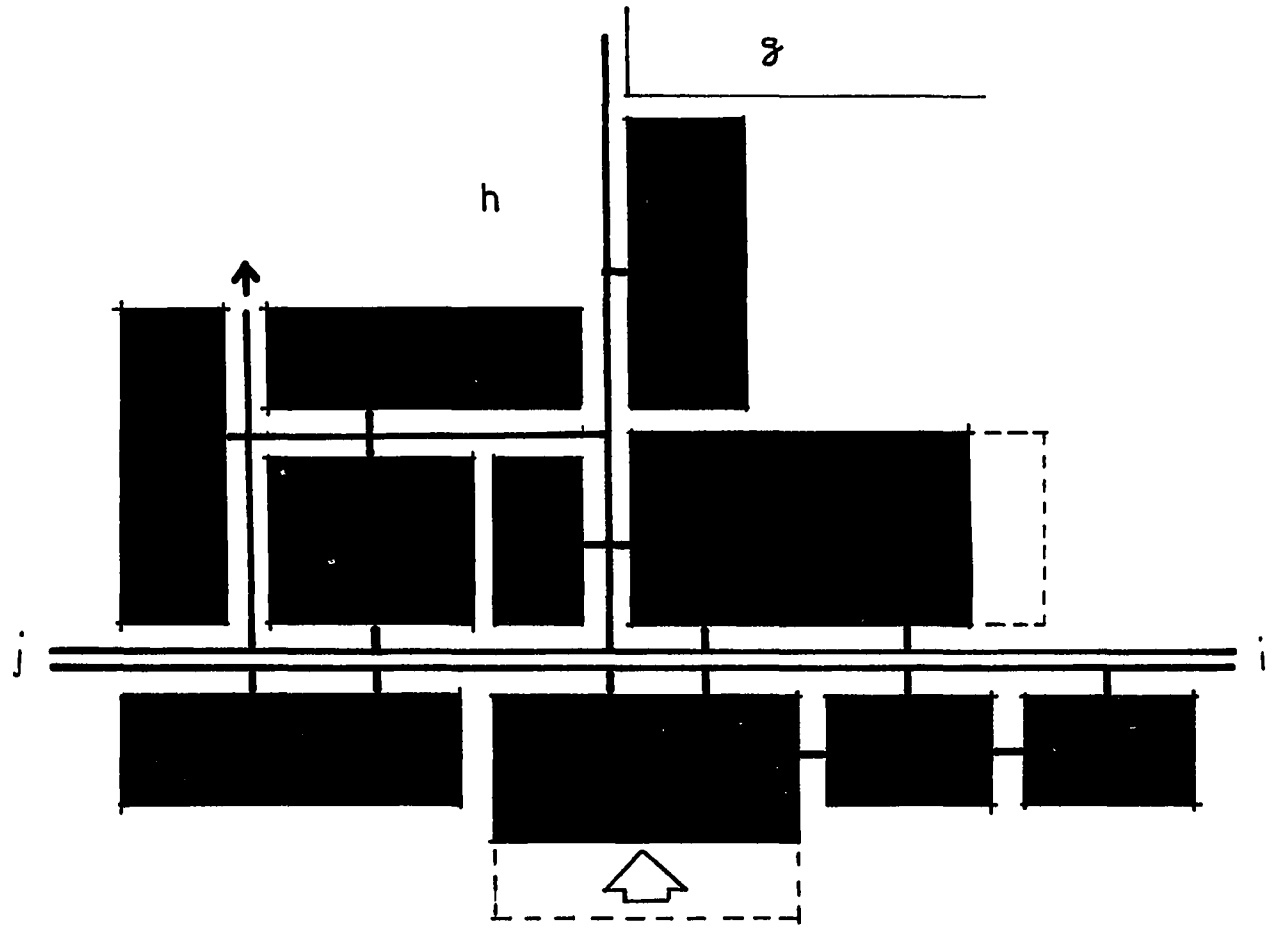
f. PROJECTION ROOM.

g. COMPUTER CONTROL ROOM.

h. TOILETS.



a. GENERAL SERVICE AREA.
b. FACULTY AREA.
c. COMPUTER BASED TEACHING AND LEARNING AREA.
d. LECTURE ROOM (150)
e. LECTURE ROOM (120)
f. REAR PROJECTION ROOM.
g. CLASSROOM (45)
h. CLASSROOM (60)
i. CLASSROOM (80)
j. SEMINAR ROOM (10 - 15)
k. TOILETS.



a. MAIN ENTRANCE (information, tel., stairs to basement).

b. CONFERENCE - REFERENCE ROOM.

c. CONFERENCE - REHEARSAL ROOM.

d. FACULTY AREA.

- d_1 radio faculty offices.
- d_2 T. V. faculty offices.
- d_3 film faculty offices.
- d_4 graphic arts faculty offices.

e. ADMINISTRATIVE AREA.

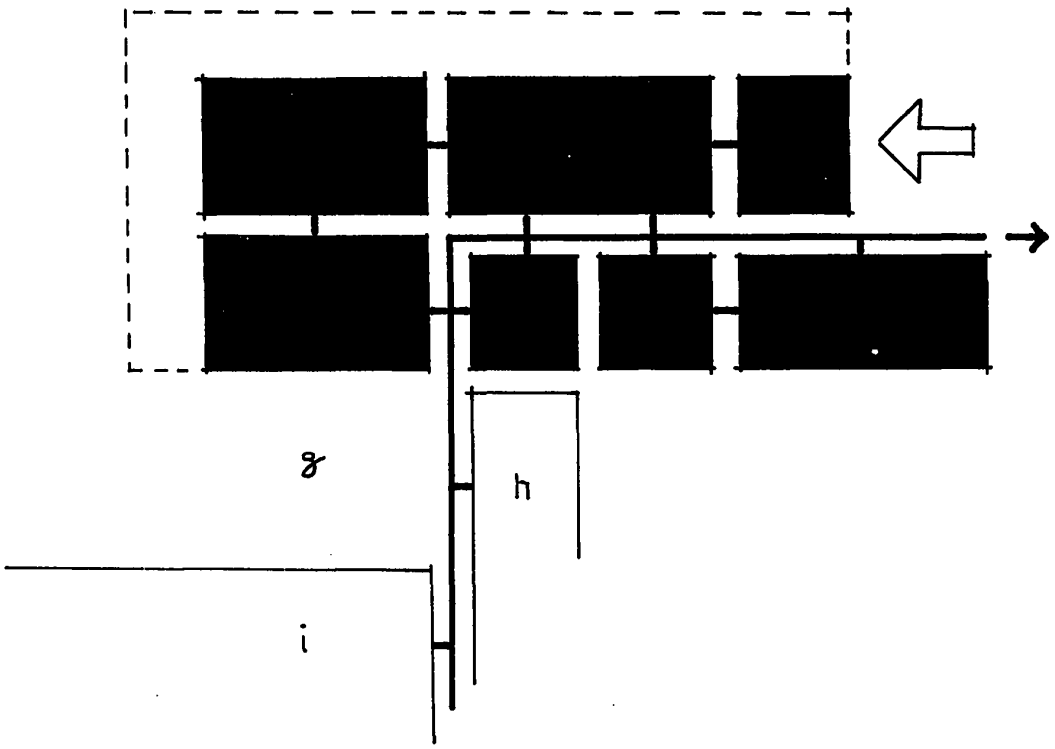
f. GENERAL SERVICE AREA (toilets, lockers, refreshment bar).

g. SUPPORTING AND PRODUCTION AREA.

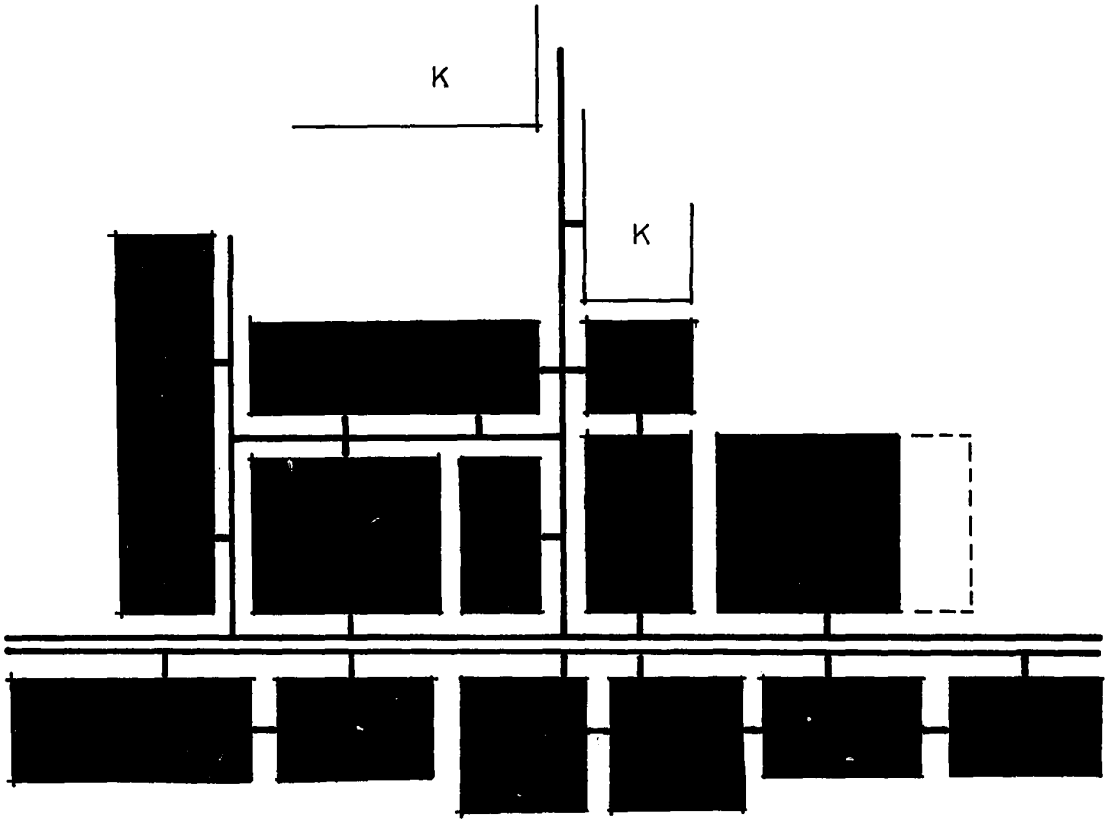
h. EXTERNAL PRODUCTION SLUB.

i. CONNECTION WITH SUB-UNIT VI (if needed).

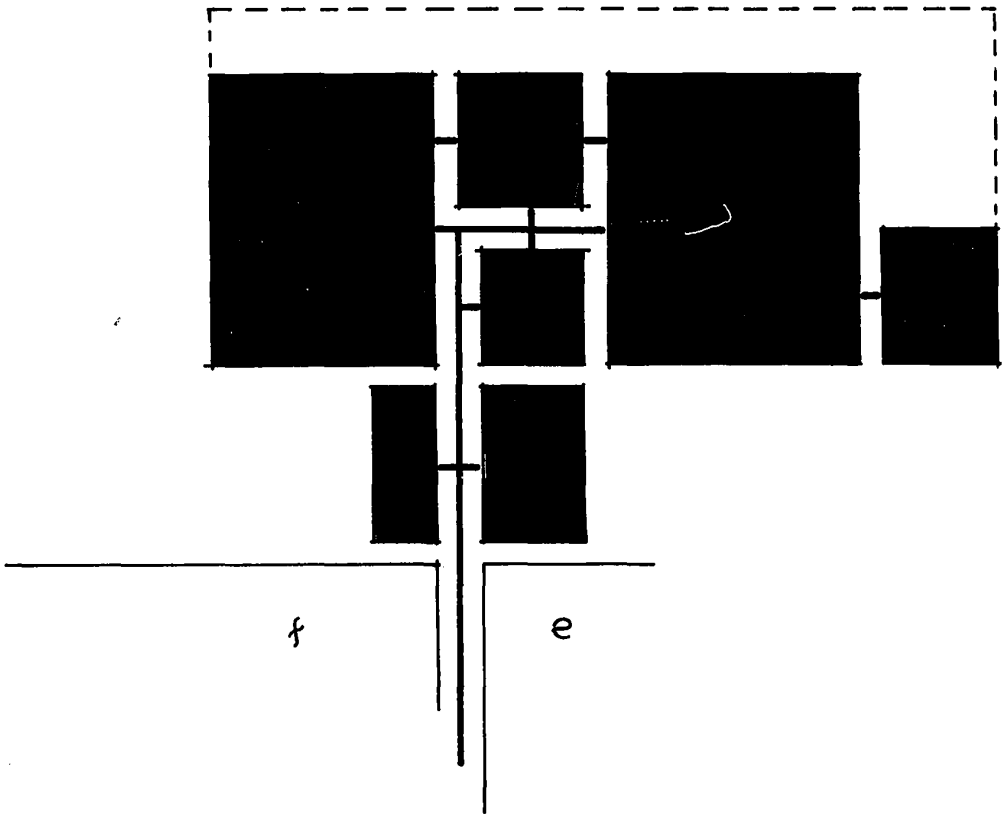
j. CONNECTION WITH UNIT I (if not with sub-unit V).



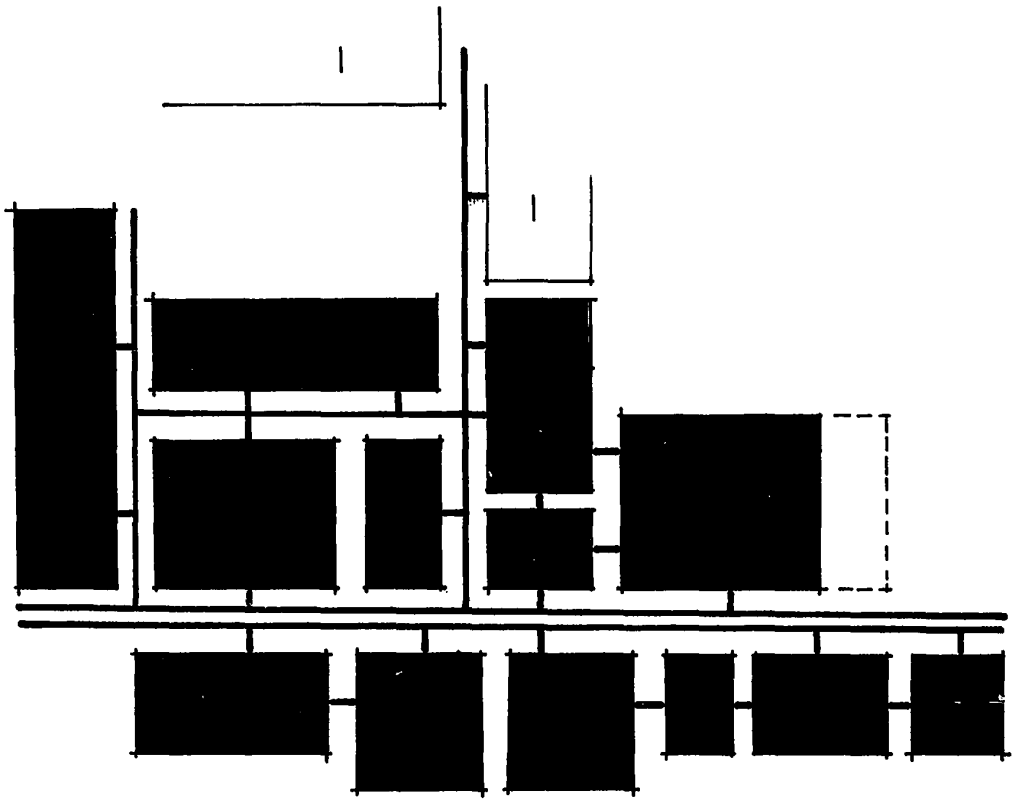
a. LOADING AREA.
b. DELIVERY, SHIPPING AND MAINTENANCE.
c. PRODUCTION STAFF OFFICES.
d. EQUIPMENT STORAGE ROOM.
e. CENTRAL STORAGE AREA.
f. MODEL AND SET SHOP.
g. EXTERNAL PRODUCTION SLUB.
h. GRAPHIC ARTS FACULTY OFFICES.
i. FILM AND T.V. FACULTY OFFICES.



a. STUDIOS.
   a_1 graphic arts.
   a_2 animation.
b. GRAPHIC AND FILM MATERIALS STORAGE.
c. PHOTOGRAPHY ROOM.
d. FILM MATERIALS PROCESSING.
e. EDITING AND ASSEMBLY.
f. PREVIEW.
g. LOUNGE.
h. GENERAL SERVICE AREA.
i. DRESSING AND MAKE-UP AREA.
j. STAFF AREA (for graphic and film departments).
k. FILM DEPARTMENT.



a. FILM STUDIO.
   a_1 interior studio.
   a_2 external production slub.
b. SOUND - FILM STUDIO.
   b_1 studio area.
   b_2 recording room.
c. STORAGE.
d. SERVICE AREA.
e. FILM VAULT.
f. COMMON SPACES (graphic arts and film departments).
g. GRAPHIC ARTS DEPARTMENT.



a. VERSATILE STUDIO.

b. TALK STUDIO.

b_1 studio area.

b_2 announce booth.

c. CONTROL ROOM.

d. SOUND RECORDING ROOM.

e. LISTENING ROOM.

f. RECORDS AND TAPES COLLECTION.

g. LOUNGE.

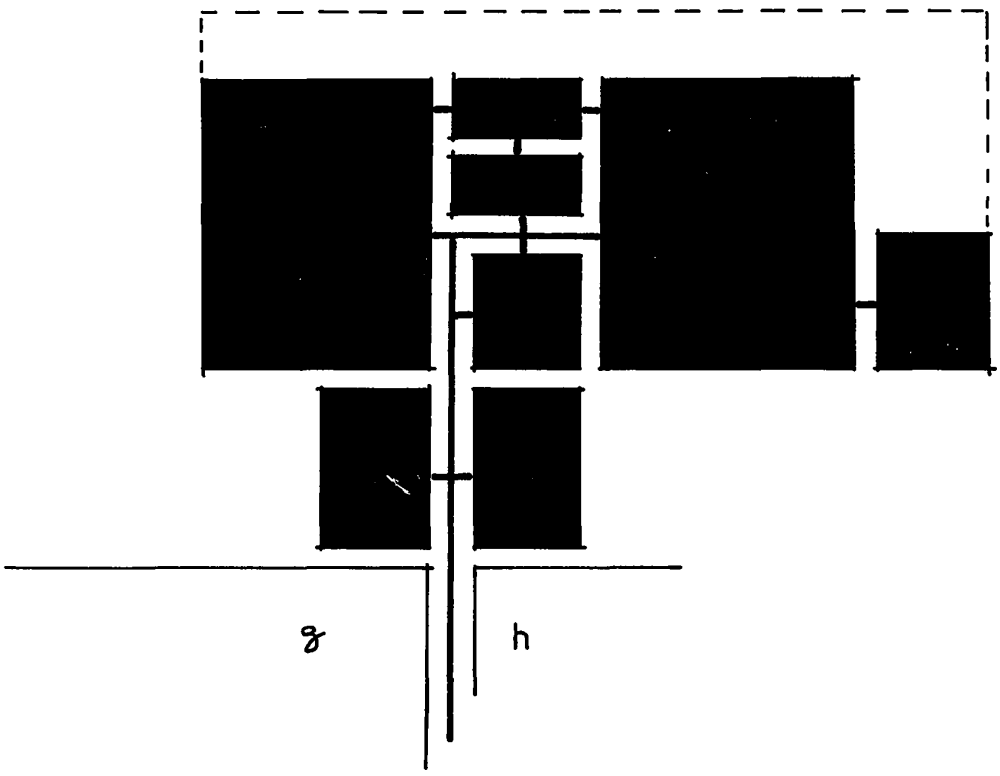
h. GENERAL SERVICE AREA.

i. DRESSING AND MAKE-UP AREA.

j. STAFF AREA (for radio and T.V. departments).

k. MATERIALS AND EQUIPMENT STORAGE.

l. T. V. DEPARTMENT.



a. T V PROJECTION STUDIO.
   - a_1 studio area.
   - a_2 projection.
   - a_3 external production slub.

b. T V RECORDING STUDIO.
   - b_1 studio area.
   - b_2 recording.

c. CENTRAL ENGINEERING ROOM.

d. STUDIOS' CONTROL ROOM.

e. STORAGE.

f. SERVICE AREA.

g. COMMON SPACES (radio and T V departments).

h. RADIO DEPARTMENT.

COMMUNICATION - ENVIRONMENT PLANNING

THE HIDDEN DIMENSIONS OF ARCHITECTURAL SPACE

by
Polydoros M. Zekkos
Master's Student
Department of Architecture
McGill University
Fall 1971

APPENDIX

Due to rapid technological progress, many fundamental changes are taking place in the world today. The Twentieth Century is known as the "electronic age" because of the increasing emphasis placed on technology in all fields.

This electronic world extended the range of communication media so much that it affected the human environment, changing it from a passive to an active one, in which people are made aware of all new events and developments as they happen.

In the following paper, prepared for a course in December 1971, the influence of communication media on today's man is examined, as well as its general effect on the human environment and the way in which we will adapt to the future (by discovering the new meaning of architectural space and grasping its unprecedented scale and its dimensions - "hidden dimensions.").

The paper is submitted as an appendix, because the thesis is an extension of the basic idea, though dealing with a more specific area, the effect of communication media in the environment of higher education, and the steps we must undertake in preparing for the future by the establishment in stages of a complete university instructional materials centre.

IV

Communication

From the moment that man becomes aware of the need for group life, he requires means of communication and expression.

With increasing urban concentration, communication media gain a larger audience and greater power. Marshall McLuhan believes that "medium is the extension of human senses," that's why communication between the individual and the rest of the world acquires unprecedented self-sufficiency: the home becomes a private control tower. Yet, its interior space and furnishing have not undergone any significant change; the new dimension afforded by communications stands in direct conflict with the traditional four walls of the house.

The technical advances that have extended communications so much can have a similar effect on the environment. This might seem a dreadful thing at first, but in one way or another it happens the moment a person can get information about everything that is going on. That such information can become an "ornamental" background to his life, is perhaps no more than inevitable.

But this is only one example of the transformation of communication media into an environment, for at the same time man will be able to make varied use of it. Through his own projection system, he will be able to change his environment as he pleases and create the decorative background that suits his mood.

The argument that, the ease with which communication means can be obtained, alienates man from his privacy and makes him the victim of guided information, is only the pessimistic point of view. But there is another side to the coin: the tremendous amount of information with which he is bombarded, allows man to see himself in relation to the rest of the world. Today, the man in the street is capable of influencing his own fate far more than at any other time in human history. The fears that often make him pessimistic, originate in the knowledge that he can only affect the course of his life with great difficulty and at a slow pace. Alvin Toffler in his book Future Shock, explains the steps that man has to undertake to reach tomorrow and what happens to

people who are oppressed by change. It is about the ways in which we adapt or fail to adapt to the future.

Toffler talks about a rapid change and declares that due to our technological progress, man's home, which is now only a receiver, will one day become a transmitter as well. Then his attitude will become equally active as it is now passive, for he will be able, for example, to vote from his home, to protest from it, or to do anything else he may wish - all from within his own private sanctuary. Through mass media his voice, his opinion will carry far and spread beyond man's wildest dreams and as a result, according to McLuhan, mass media will "retribalize the 20th Century man into a team of sensual participation," which in fact transforms the "Globe into a Village," and catapults today's man back to the life of 1971 B.C.

Environment Planning

The need to study of such a human environment in an integrated way became apparent first to the architect and city-planner, through a sense of professional conscience. We are constantly called upon to create environments for individuals or groups, and we discover rather soon in our career that we perform this important task in a completely arbitrary way. Perhaps not arbitrary, but at best empirical and intuitive. So the success of an architectural or city-planning design becomes a hit-and-miss affair.

For this reason, many efforts have been made to integrate the sciences that study man, his environment and his settlements into a common approach, which the Greek architect and town planner, C. A. Doxiadis called "Ekistics." This rather sensible attitude presents almost unsurmountable obstacles. First and foremost, architects, planners, engineers, psychologists, sociologists, doctors, economists, do not talk the same language. Each discipline has its own scientific jargon, and guards it jealously. This makes communication difficult, and preserves the

absolute system of watertight compartments in the sciences. Another difficulty is that all these people do not know how to work together. They have different attitudes and, more important, different mystiques about their profession.

However, human problems are complex and pressing. Their successful solution urgently requires the combined efforts of many disciplines. And this is the force that will help us over-ride all the difficulties.

We have already made some small progress in the co-ordinated approach to environment planning. And the outline of a methodology starts to emerge.

The first step is the identification of the human nucleus for the particular environment - that is, what kind of people are going to live in it and use it. It can be an individual, a group, a society or an organized total of societies. This is not very difficult to determine. However, human nuclei develop with time, which environment, being a physical entity, is much less flexible. A house or hospital may be usable for thirty years or more. But the people who will use the building

and its functions will change considerably in this interval. For this reason in each case we are led to examine a dynamically evolving human nucleus.

The second step is to determine the essential needs of the nucleus to be satisfied; and, if possible, to express these needs in quantified terms, so that they are measurable and comparable. The French psychiatrist, P. C. Racamier believes that, at this step, psychologists and architects should work together to attain the proper functioning of a settlement and to satisfy the psychological needs of man, for he claims that architecture not only reflects the man but determines the man.

Basic human needs do not change, but activities, that is, conscious or subconscious efforts of the human nuclei to satisfy their needs, change tremendously along cultural lines. This adds one more complication to the problem.

Once human needs and the resulting activities are known, it is not difficult to establish qualitative correspondence with environment factors. But once we try to express these correlations quantitatively, we get into

deep waters, and a lot of additional research is necessary.

In the final phase, where the architect's work really starts, we control environment factors in such a way as to facilitate the satisfaction of human needs. This presents negligible technical difficulties, because modern technology has developed methods of operating upon the natural landscape and of creating man-made environment on an unprecedented scale. And it is a proof of our lack of certainty and our timidity, that we have not been able to use these tools in a more creative way.

This type of integrated approach to environment planning will be generally applicable only if we will be able to grasp this unprecedented scale, its dimensions - "hidden dimension" - and the new meaning of architectural space. And it is hoped that such a method of studying and planning our milieu will prove both theoretically meaningful and applicable to current problems.

XI

The Hidden Dimensions of Architectural Space

Perhaps the only conclusion which can be drawn from the research presented in the previous chapters is that man transcends the influence of the physical environment and, thus, his behaviour in relation to the surrounding space cannot be explained in purely mechanistic terms. Those who tried to view the physical dimensions of the environment as independent variables and study their effect on human life (from a sociological, psychological or even biological standpoint) have failed so far to establish any relationships presenting some regularity comparable to that found in natural phenomena; in most cases their assertions are even contradictory. It would be erroneous, however, to infer from this fact that human behaviour is more or less independent of the physical environment. To the contrary, it is because of man's constant interaction with his environment at all levels that their transactions are so complex as to elude all theories which tend to isolate the physical features of the environment by stripping it of its human meaning. Space inhabited by man is not only a space

"to live in" but also a space "to be lived," something to be felt and experienced. Thus its physical dimensions are always interwoven with some hidden dimensions which stem from human consciousness. To what extent these hidden dimensions are susceptible to empirical analysis and scientific scrutiny we do not know. Yet human sciences cannot ignore them and they do try to grasp them and to assess their role within the "man-environment" system.

A fundamental question which has been sufficiently elucidated by experimental psychology is how man perceives his surrounding space. The work of the Gestalt psychologists has demonstrated that perception in general is not built up by the accumulation of elementary sensory information; it is articulated from the very outset and correlated with the functional operations of psychical life as a whole. Thus, space perception can only be explained as a highly complex and yet primordial experience. Man does not live in an abstract isotropic space, but in a space which is heterogeneous both

objectively (due to gravity) and subjectively (due to the dependence of visual, tactile, acoustical and kinetic sensations upon the spatial position of the human body). As M. Merleau-Ponty has amply shown, it is through his body, experienced as a centre of sensations and as a system of potential movements and actions, that man belongs to and embraces space. In relation to the human body, space acquires an existential significance and its perception can be understood only within the context of a broad perceptual field which offers to the specific subject the possibility of an anchoring. By synthesizing the experience from his immediate surroundings around his own body, man develops "a sense of spatial identity" which is fundamental to his vital functions. Seeking to define a place of his own in a world subjected to change and discontinuity, he projects himself into the physical space and enriches it with meaning and values. Between himself and the surrounding objects there is not only a geometrical distance, but an experienced distance that measures at each moment the amplitude of his own life.

Some of the links that bind man to space are perhaps inherent to his biological structure for they have been noticed in animals as well. Most living organisms have the habit of laying claim to a specific area and of defending it against their own kind. To illustrate this habit, the English ornithologist, H. E. Howard who first described it, coined the term "territoriality." Later on, the famous Swiss zoologist, H. Hediger, analyzed various aspects of territoriality and tried to explain the mechanisms by which it operates. Many others have also pointed out the critical significance of space in animal behaviour, as well as the pathological phenomena which accompany spatial restriction. Another well known phenomenon, closely related to territoriality, is the "dominance behaviour" exhibited by animals confined to a limited space which does not allow for the development of individual territories. Since similar phenomena have been observed among humans, especially among those living in confinement, territoriality and other related concepts are increasingly used in the study of man's spatial behaviour. At the same time,

psychology and small group sociology began to pay attention to spatial variables such as the distance between individuals or their relative position in a certain milieu. Combining the evidence from this sort of research with personal observations made in various countries, the American anthropologist, Edward T. Hall - whose own expression I borrowed for the title of this chapter - succeeded in showing all the wealth of psychological and social dimensions of space as well as the varying ways in which people from different cultures treat it as expressive means. A similar, but more specialized effort, was recently made by the American psychologist, Robert Sommer, who emphasized the importance of "personal space" in regard to architectural design. He defined this term to include both the emotionally charged zone around each person - Hall had called this zone a "bubble" - and the processes by which people personalize the spaces they inhabit.

The hidden dimensions of architectural space have also been "discovered" by contemporary aesthetics.

Already at the turn of the century the "Einfuhlung" theorists of art had attempted to explain aesthetic experience as a kind of sympathy with the symbolic expressiveness of art forms. Scientific empiricism has also acknowledged the symbolic character of the work of art, but consistent with its anti-metaphysical bias it condemned any attempt at building up a philosophical theory of art. For analytical philosophers, art is a language used simply to express certain feelings and evoke emotional responses; thus it does not have any theoretical value. The language of art and the language of science have nothing in common. This dichotomy had even been present within the natural language itself by distinguishing the logical and the emotive uses of language. As opposed to this positivistic outlook, the followers of the idealistic tradition insisted on the cognitive character of artistic activity. The philosopher, Ernst Cassirer, in his Philosophy of Symbolic Forms, had placed art among those systems in which the human vision of the world is objectified and, in a later essay, he defined it as "a

symbolic language" that enables man to "understand and interpret, to articulate and organize, to synthesize and universalize his human experience." On the fundamental concept of "symbol," as universalized by Cassirer, Suzanne Langer built up a more systematic and comprehensive theory of art. Taking her point of departure from an analysis of musical significance which she had made in an earlier book, Langer, in her now classic Feeling and Form, defined art as "the creation of forms symbolic of human feeling." The symbolic import of each artistic form, she explained, is indissolubly bound to its articulation which is the logical expression of a sensuous and emotional experience. The work of art is "a developed metaphor, a non-discursive symbol that articulates what is verbally ineffable - the logic of consciousness itself." Within the theoretical framework, Langer dealt with architectural space in a novel way. She took it to be, irrespectively of its practical usefulness, a virtual entity, a created place that symbolically defines and expresses "a realm of

functional existence." Langer's theory of architecture, though of a purely philosophical origin, agrees with the findings of some anthropologists and sociologists who among both primitive people and modern city dwellers found symbol-making to be a fundamental process through which man tries to organize the impressions he has from his physical environment and to establish some safe emotional relations with it. On the other hand, Langer's general theory of art bears some significant resemblances with views held by thinkers of a quite different origin, such as Heidegger, Jaspers, Buber and Sartre.

Parallel to Langer's, but of a somewhat different character, is the effort made by some contemporary thinkers to interpret architecture in the light of a general "theory of signs." Such a theory had been postulated at the turn of the century by both the Swiss linguist, F. de Saussure and the American philosopher, C. S. Peirce; the first had called it "semiology," while the second, "semiotics." Important contributions to the foundation of this theory came originally from

the attempts of the logistics to formulate a purely logical language, but the first to give it a broader scope was the American philosopher, Charles W. Morris. In its later development, the theory of signs, followed the path set by linguistics especially in its structuralist orientation as advocated by Saussure and his followers. The distinctions and methods promoted by linguistic structuralism have also been adopted by some French scientists in other fields of research, such as anthropology, literary criticism, and the history of ideas. The first attempt to view art from a semiological standpoint was made by Morris himself who, in an article in 1939, maintained that the work of art is a sign and hence aesthetics is part of semiotics. Morris, though of a neo-positivist descent, tried to evade the clear-cut distinction between logical and emotive meaning and eventually recognized that values, as embodied in a work of art, are "objectively relative" properties of both signs and signified objects. Morris's work and linguistic structuralism led some contemporary students to a search for explanations of art based on "semiology" or

"information theory." Within this conceptual framework there have been some attempts to view also architecture as "a system of signs." We cannot say, however, that the semiological approach to architecture has proved to be fecund. Essentially, it has limited itself to speech about architectural forms, revolving round the natural language which, as Barthes pointed out, remains the common and almost necessary tool for the semiological analysis of all non-linguistic codes.

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b) McLuhan, Marshall: War and Peace in the Global Village. Bantam Book Company, New York, 1968.

c) Hall, Edward T: The Hidden Dimension. Anchor Book Company, Inc., New York, 1966.

d) Doxiadis, Constantinos A: An Introduction of the Human Settlements. Hutchinson & Co., London, 1968.

e) Racamier, P. C: Psychology of Space. Architecture Formes et Fonctions, No. 14 - 1968 (pages 39-41).

f) Toffler, Alvin: Future Shock. Bantam Book Company, New York, 1970.

McLuhan, Marshall

He studied at Manitoba University and he received his Ph.D. in English literature at Cambridge University. He taught at several universities in the U. S. and Canada and presently he is the Director of the Centre for Culture and Technology at the University of Toronto.

a) Understanding Media

The two main themes in the book are (1) Medium is the message, and (2) Hot and cold media.

(1) Medium is the message is his key formula. McLuhan believes that medium is the extension of the human senses, that is why he states that it is a personal reaction, based on the way the receiver receives the message and not what the message tries to determine to the receiver.

(2) Hot and cold media - concerned with mass production, hot medium is defined as "highly information" and as a result only few can comprehend or decipher the exact message. Hot medium according to McLuhan are films,

books and print. Cold medium on the contrary is a "low information" which the majority is capable of deciphering and comprehending, such as messages which are conveyed in telephone conversations, discussions and television.

b) War and Peace in the Global Village

McLuhan declares that down through the ages, means by which man communicates have determined his thoughts, his actions, his life and that the mass media evokes a "communication awareness." He also declares that mass media of today also acts as a dividing element, in that it re-tribalizes the 20th Century man - the man of the electronic age - into a team of sensual participation, which in fact transforms the "globe into a village," and catapults today's man back to the life of 1971 B.C.

Hall, Edward T.

He got his B.A. from Denver University, his M.A. from the University of Arizona and his Ph.D. in Anthropology from Columbia University. He taught at several universities in the U.S. and presently he is a professor in Anthropology at North-Western University, Evanston, Illinois.

c) The Hidden Dimension

The message that Hall tries to determine with this book is that no matter how hard man tries, it is impossible for him to divest himself of his own culture, for it has penetrated to the roots of his nervous system and determines how he perceives the world. Most of culture lies hidden and is outside voluntary control, making up the warp and weft of human existence. Even when small fragments of culture are elevated to awareness, they are difficult to change, not only because they are so personally experienced, but because people cannot act or interact at all in any meaningful way except through the medium of culture.

The above is the author's summary in the briefest possible sense, about what he declares in this book, The Hidden Dimension, Page 188.

Doxiadis, Constantinos A.

He is a Greek architect and townplanner. He was Minister of Public Works for several years as well as professor at the National Technological Institute of Athens, Greece. Presently he is the President of the Athens Technological Organization as well as director and professor of the Athens Centre of Ekistics, which is organizing every year the Delos International Symposium.

d) An Introduction of the Human Settlement

The word "ekistics" that Doxiadis introduces in his book comes from an ancient Greek word and can be interpreted as an overall science concerning the foundation of a house, a habitation, a city or a state.

However, Doxiadis feels that there is a problem which most people fail to see and that is that "the shell" or covering for humans must be keeping up with the human's culture. As a result he feels that before the architect and town planner start the design of a "shell" or of a "city," they should work - study, with a number of professionals, people from various fields - such as educators, psychologists, sociologists, lawyers,

politicians, et cetera so as to gain a better insight of the people they will be designing for. He calls this study - science "ekistics" and he believes that only through it we will be able to solve the crisis confronting human settlements. These are constituted according to him from the following five elements - man, society, networks, shells and nature.

Racamier, P. C.

He is a French psychiatrist and psychologist and taught at several universities in France and Switzerland. Presently he is a member of the International Society of Psychologists as well as a member in several other societies.

e) Psychology of Space

In this book Racamier claims that architecture is the most characteristic element of a civilization, because it integrates the technological evolution, the sociological evolution, the psychological evolution and the aesthetical evolution.

He believes that psychologists and architects should work together, to attain the proper functioning of a settlement and to satisfy the psychological needs of man, for he claims that the architecture not only reflects the man, but the architecture determines the man. For example, he believes that the psychologists could be of help to the main dilemma in architecture, the main dilemma being whether we should build open or closed

living spaces. This is, as well, a psychological dilemma because human needs call for both freedom and security.

Toffler, Alvin

He is a journalist and presently a former associate editor of Fortune. He has been a visiting professor at Cornell University on the "sociology of the future." He is now a visiting scholar at the Russell Sage Foundation.

f) Future Shock

In this book, Toffler explains the steps that we have to undertake to reach tomorrow and what happens to people who are oppressed by change. It is about the ways in which we adapt or fail to adapt to the future.

He talks about a rapid change mainly due to our technological progress. This change is so powerful that it shifts our values and changes the relationship between people in family, friendship, sex, politics as well as the relationships between people and their dwellings, their education, their business, et cetera.

Toffler concludes that the "Future Shock" will be realized if the tools with which we are equipped to face tomorrow are obsolete, or are futile in that they are not born in view of our rapid transition.

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